C-130H
Operational Planning Data

MER 566

Lockheed-Georgia Company

C-130H

Hercules

Operational Planning Data

MER 566/March 1981

Military Market Research and Engineering
Lockheed-Georgia Company
Marietta, Georgia 30063

INTRODUCTION

The C-130 series of transport airplanes has proven to be one of the most well known and versatile airplanes ever built. The C-130H model Hercules is the current basic version being built at the Lockheed facility in Marietta, Georgia and follows three other basic predecessor models: The C-130A, the C-130B and the C-130E. More than 1600 Hercules have been produced, including almost 600 for international and commercial customers.

The export or international version of the C-130H described in this document is almost identical in physical size and appearance to the United States Air Force C-130H model operated by USAF and others. The C-130H version utilizes the T56-A-15 engines in lieu of the -7 model on the C-130E models. These -15 engines provide more power and better maintainability than the -7 engines, which result in improved performance, and better mission reliability for the C-130H than for earlier C-130 models.

The current C-130H model also incorporates airplane system components and equipment representative of state-of-the-art design which provide improved maintenance and reliability features over the earlier C-130 models. In some cases the components of the international C-130H are different than those used on USAF C-130H airplanes.

The basic configuration described in this report includes external, wing mounted fuel tanks. These external fuel tanks formerly were optional items which were incorporated on most of the C-130 airplanes currently operated by international customers.

This document provides technical data for accomplishing performance and operational analyses of the export or international version of the basic transport configuration of the Lockheed C-130H Hercules airplane. This document was not intended to provide data for the analyses of special configurations of the Hercules, such as ski equipped, inflight refueling and maritime patrol versions.

The dimensional weight, and system description data were obtained from Lockheed Model Specification ER/S 7100M dated 1 February 1981. Performance data were obtained from Lockheed Flight Manaul SMP 777, dated 21 August 1980. Loadability and airport/airfield requirements data were obtained from various Lockheed reports prepared for use by C-130 Hercules operators.

TABLE OF CONTENTS

Section	Title	Page
	INTRODUCTION	i
	TABLE OF CONTENTS	ii
1	AIRPLANE DESCRIPTION	
	General Description	1
	Weights	3
	Inboard Profile	4
	Systems	5
	Cargo Compartment	9
	Personnel Loading	14
	Cargo Handling System and Palletized Loading	15
	Vehicle Loading	16
2	AIRPORT OPERATIONS	
	Danger Areas	17
	External Sound Levels	17
	Interior Noise Levels	19
	Ground Maneuvering	20
	Parking Space	21
	Terminal Servicing	22
	Runway/Airfield Strength	23
	Runway/Airfield Wheel Loads	24
	Asphalt Pavement Thickness	27
	Concrete Pavement Thickness	28
	LCN – Asphalt Pavement	29
	LCN – Concrete Pavement	30
	Unpaved Airfields	31
	Runway/Airfield Roughness	32
3	AERIAL DELIVERY	
	Aereal Delivery Applications	33
	Special Airdrop Techniques	36

Section	Title	Page
4	PERFORMANCE	
	Chart/Graph Criteria	41
	Normal Takeoff Distances	43
	Rate of Climb	45
	Speed/Altitude Summary	45
	Time, Distance, Fuel To Climb	46
	Range Integration	47
	Optimum Endurance Cruise	48
	Search/Surveillance Cruise	49
	Time, Distance, Fuel to Descend	50
	Reserve and Holding Fuel	51
	Normal Landing Distance	52
	Payload – Range	53
	Block Speed/Block Fuel	54

1

Airplane Description

GENERAL DESCRIPTION

The C-130H is a four engine, medium size transport airplane designed to carry personnel, vehicles, and cargo. This rugged and versatile airplane can operate from almost any kind of paved or unpaved airfield surface and has an unmatched capability to perform a large variety of missions.

This current production model of the C-130 series is almost identical in appearance to its immediate predecessor model, the C-130E. It is an all metal, high wing monoplane powered by four Allison T56-A-15 prop jet engines. It is equipped with a dual wheel, tricycle landing gear, with the main gear wheels arranged in tandem and a side-by-side nose gear arrangement.

The interior of the C-130H includes a flight deck with four crew positions and a cargo compartment which is approximately 12.62 meters (41.4 feet) long, 2.74 meters (9 feet) in height, and 3.04 meters (10 feet) wide. The floor of the cargo compartment is constructed of aluminum alloy material and includes full length anti-skid treadway areas and a 51 cm (20-inch) grid pattern of recessed tiedown rings.

An integral loading ramp and cargo door system is provided and can be positioned from truck bed height to ground level for ground loading operations and can be opened in flight for aerial delivery operations.

The configuration of the cargo compartment can be changed quickly to accommodate vehicles, bulk cargo, palletized cargo, aerial delivery items, up to 92 passengers, up to 64 paratroops, and up to 74 litter patients plus two attendants. For normal conditions, the maximum payload of the C-130H is 19,704 kilograms (43,449) pounds).

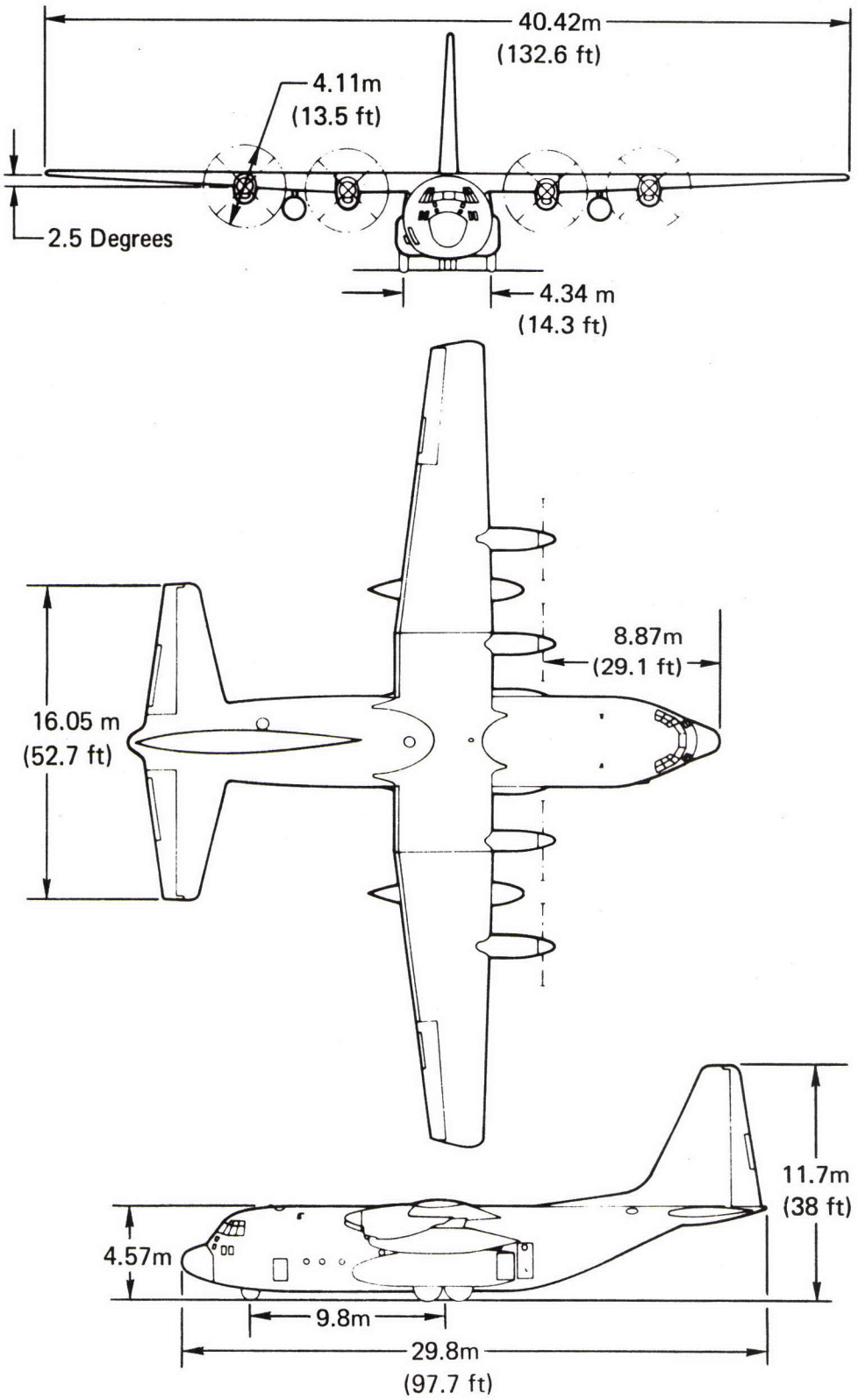
A three view drawing with dimensions is shown on page 2.

A statement of weights is shown on page 3 for the configuration with external fuel tanks and without the cargo handling system installed.

The C-130H-30 is a version of the C-130H which incorporates a 4.57 meter (15 feet) stretched fuselage. The general description of the C-130H-30 is identical to that for the C-130H, above, except for the following items.

o	Cargo compartment length	=	17.19 meters (56.4 feet)
o	Number of Passengers	=	128
o	Number of paratroops	=	92
o	Number of litter patients	=	98
o	Normal maximum payload	=	39,676 pounds

THREE-VIEW


40.42m
(132.6 ft)
4.11m
(13.5 ft)
2.5 Degrees
4.34 m
(14.3 ft)
16.05 m
(52.7 ft)
8.87m
(29.1 ft)
11.7m
(38 ft)
4.57m
9.8m
29.8m
(97.7 ft)

WEIGHTS

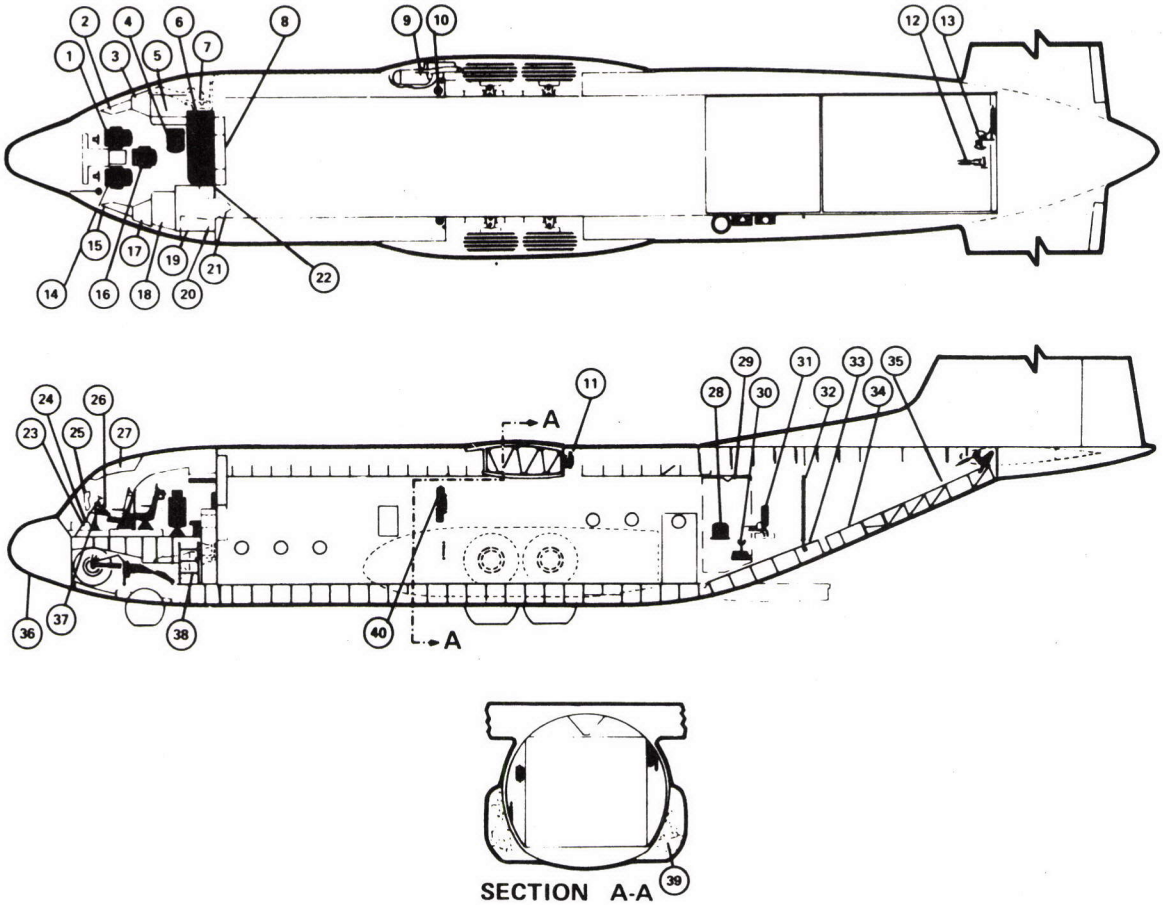
For the configuration with external fuel tanks and without the cargo handling system installed.

	Weights	
	Kilograms	Pounds
Airplane Empty Weight	33,285	73,284
Operating Items		
Crew(4)	363	800
Unusable Fuel	282	621
Oil, Usable and Trapped	212	468
Cargo Tiedown Equipment	204	450
Food and Water	32	70
Operating Weight	34,328	75,693
Maximum Zero Fuel Weight (2.5g)	54,032	119,142
Maximum Payload (2.5g)	19,704	43,449
Maximum Takeoff Weight (2.5g)	70,295	155,000
Maximum Takeoff Weight (2.25g)	79,365	175,000
Maximum Landing Weight (1.5 mps sink)	70,295	155,000
Normal Landing Weight (2.7 mps sink)	58,957	130,000

Cargo Handling System

When the standard A/A 32H-4A cargo handling system is installed, airplane empty weight and operating weight are increased 829 kg (1829 lb) and maximum payload is reduced the same amount.

INBOARD PROFILE



SECTION A-A

1 Co-Pilot's Seat	21 Crew Entrance Door
2 Co-Pilot's Side Console	22 Closet
3 Co-Pilot's Circuit Breaker Panel	23 Pilot's Rudder Pedals
4 Navigator's Seat	24 Nose Gear Steering Wheel
5 Navigator's Station (Desk Panel Consoles)	25 Flight Station Instrument Panel
6 Bunks	26 Control Stand
7 Flight Deck Air Conditioning Unit	27 Overhead Control Panel
8 Main AC-DC Power Box	28 Toilet
9 Cargo Compt. Air Cond. Unit	29 Toilet Curtain
10 Booster Hydraulic Reservoir	30 Aft Urinal
11 Aileron Booster	31 Ramp & Auxiliary Hyd. Reservoir
12 Elevator Booster	32 Ramp Actuating Cylinder
13 Rudder Booster	33 Cargo Ramp
14 Pilot's Seat	34 Aft Cargo Door
15 Pilot's Side Console	35 Aft Cargo Door Actuating Cylinder
16 Flight Engineer's Seat	36 Radar
17 Pilot's Circuit Breaker Panel	37 Pilot's Control Column
18 Galley	38 Crew Compartment Ladder
19 Galley Moveable Floor	39 Auxiliary Power Unit
20 Cargo Compartment Door	40 Utility Hydraulic Reservoir

SYSTEMS

Configuration The system descriptions contained in this report are applicable to the standard transport version of the international C-130H airplane which includes the external wing fuel tanks.

Power Plants The C-130H is equipped with four Allison T56-A-15 propjet engines. These engines are "flat rated" at 4,508 equivalent shaft horsepower for takeoff from sea level to 7,000 feet altitude at standard temperatures. This rating also permits takeoff power at sea level up to 20°C above standard temperature.

These T56-A-15 engines produce an average cruise fuel consumption for the C-130H of 2041 kilograms (4,500 pounds) of fuel per flying hour.

Propellers Hamilton Standard 54H60-117 four blade, full feathering, and reversing propellers are provided. Propeller diameter is 4.11 meters (13.5 feet). Engine gear box reductions is 13.54 to 1.

Fuel/Oil The fuel capacity of the internal wing fuel cells is 26,344 liters (6,960 U.S. gallons). The capacity of two pylon mounted external wing fuel tanks is 10,295 liters (2,720 U.S. gallons). Total fuel capacity of the external and internal fuel tanks is 36,639 liters (9,680 U.S. gallons).

For aerial refueling missions, wing mounted probe and drogue refueling systems are available. Either a system for fighter refueling or for helicopter refueling can be incorporated. Also, additional fuel for aerial refueling can be carried in either a single 13,626 liters (3600 U.S. gallons) tank or two 6,813 liter (1800 U.S. gallon) tanks.

The fuel tanks normally are refueled through a single point refueling panel at a rate of 2,271 liters (600 U.S. gallons) per minute. Over-wing fueling can also be accomplished.

The system includes wing tip fuel jettisoning at a rate of 1,893 liters (500 gallons) per minute.

Each engine has an oil tank with a capacity of 45.4 liters (12 U.S. gallons).

SYSTEMS

Auxiliary Power Unit An electrically started APU is located in the left hand wheel well. This APU provides air for engine starting on the ground and in flight and for ground air conditioning. It also supplies electrical power from a 40 KVA AC generator mounted directly on the APU.

Flight Controls The primary flight control system consists of conventional aileron, elevator and rudder systems. Hydraulic power boost is incorporated in each system.

Automatic Pilot An electric autopilot, Collins type AP-105V, is installed. An automatic landing approach control and beam guidance feature is connected to the ILS, VOR, INS, and Omega systems through the pilot's Flight Director System.

Hydraulics The hydraulic system consists of three integrated systems. The Booster system operates one half of each control surface booster. The Utility system operates the landing gear, wing flaps, wheel brakes, and one half of each control surface booster. The Auxiliary system operates the cargo ramp and door combination and can also operate the brakes and nose landing gear extension and downlock when the Utility system is inoperative. Engine driven pumps provide pressure for the Booster and Utility systems. An electric motor driven pump provides pressure for the Auxiliary system. Normal operating pressure is 20.7 megapascals (3,000 lb/sq in).

Electrical AC electrical power is provided by five 40 KVA generators, four driven by the engines and one driven by the APU. DC power is provided from AC sources through four 200 ampere transformer rectifiers and from one 24 volt, 36 ampere hour battery.

Airconditioning and Pressurization Flight station and cargo compartment temperatures are automatically and manually operated to control heating to 21 ^{o}C with a -53 ^{o}C outside air temperature and to control cooling to 27 ^{o}C with 38 ^{o}C outside air temperature.

The pressurization system can maintain 2438 meters (8,000 feet) cabin altitude at 10,668 meters (35,000 feet) flight altitude. Air for the system is provided by engine bleed.

SYSTEMS

Oxygen Oxygen is provided from a 2.07 megapascals (300 lb/sq in) liquid oxygen converter, using diluter demand pressure breathing regulators. This equipment provides 96 manhours of 100 percent oxygen at 7620 meters (25,000 feet) altitude.

Anti-Icing Engine bleed air is used for anti-icing the wing and empennage leading edges, the radome, and engine inlet air ducts. Electrical heat provides anti-icing for the propellers, windshield, and pitot tubes.

Landing Gear/Brakes The landing gear is a modified tricycle type with dual wheels on the nose gear and tandem wheels on each main gear. The gear is fully retractable, hydraulically.

Detailed descriptions of landing gear geometry, tire inflation pressures, and tire contact areas are presented on page 24 of this report.

The brakes are hydraulically operated, multiple disc type. The braking system incorporates provisions for differential braking and parking brake control. A modulating anti-skid system is provided.

Wing Flaps The wing flaps are the high-lift, Lockheed-Fowler type and are of conventional design and construction. Normal operation is by hydraulic motor. Emergency operation is by a manual crank.

SYSTEMS

Avionics The standard configuration of the international version of the C-130H contains the following radio, radar, and electronic equipment:

Description	Designation
Communications	
HF Radio (2)	628T-1
VHF Radio (2)	618M-3A
Intercom	AN/AIC-18A
Public Address System	AN/AIC-13
Navigation	
Radio Compass, ADF, (2)	DF-206
Direction Finder, VHF/UHF	DF-301E
Marker Beacon Receiver	51Z-4
VOR/ILS (2)	51RV-4B
DME (2)	860E-5
Inertial Nav.	LTN-72
Omega Nav.	CMA 771
Flight Director (2)	FD-109
Other	
Radio Altimeter	AL101
Gyro Compass (2)	C-12
Radar, Search/Weather	RDR-1F
ATC Transponder	621A-6A
Ground Proximity Warning	Mark II
Altitude Alerter	540-25100-004

CARGO COMPARTMENT

The cargo compartment is completely air conditioned and pressurized and has a usable clear cube volume of 103.7 cubic meters (3662 cubic feet) forward of the ramp hinge. The clear cube dimensions are 12.31 meters (40.4 feet) in length, 2.77 meters (9.1 feet) in height, and 3.04 meters (9.96 feet) in width. Cross section dimensions of the cargo compartment are shown on page 10.

The high strength, metal floor incorporates treadways for wheeled vehicles and a recessed tie-down ring system. Additional tie-down rings are located on the cargo compartment side walls and on the integral loading ramp. The tiedown ring arrangement is shown on page 11.

An integral loading ramp and door system, shown on page 12, is operable in flight for airdrops and opens on the ground for positioning from ground level to truck bed level. The ramp is 3.11 meters (10.2 feet) wide and 3.14 meters (10.3 feet) in length. The ramp can carry a 2268 kilogram (5000 pounds) maximum load in flight.

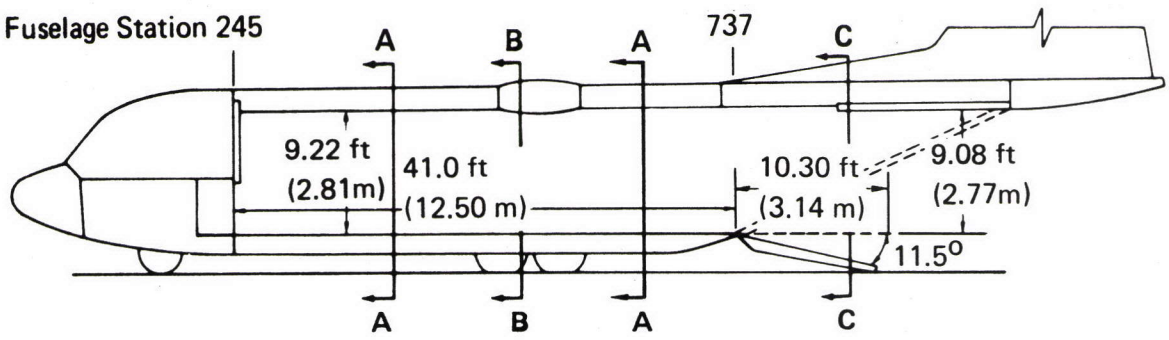
Loading Arrangements The cargo compartment can be arranged to carry loads of vehicles, containers, bulk cargo, palletized cargo, passengers and combinations thereof. Vehicles and wheeled containers can be driven, or moved, on and off the airplane over the integral ramp from truck bed, dock and ground level. Load limitations for the cargo compartment are described on page 13.

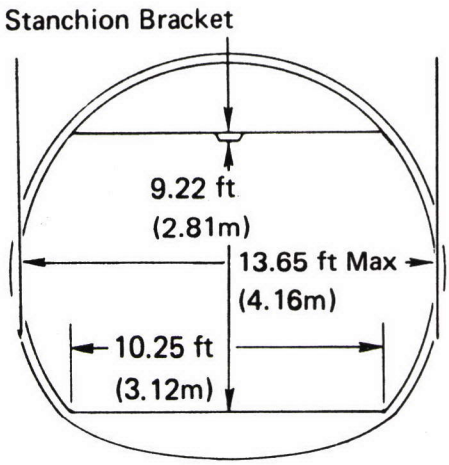
The C-130H is equipped with stanchions, canvas seats, and litters for carrying either 92 passengers, or up to 64 paratroops or 74 litters plus 2 attendants or 70 litters plus 6 attendants. Combination loads of passengers and litters can also be carried. Arrangements for litters and passengers are shown on page 14.

Loading Aids Several items useful for the loading operations are supplied with the airplane. These loading aids include wheeled pry bars, a portable electric winch, and snatch blocks/loading pulleys.

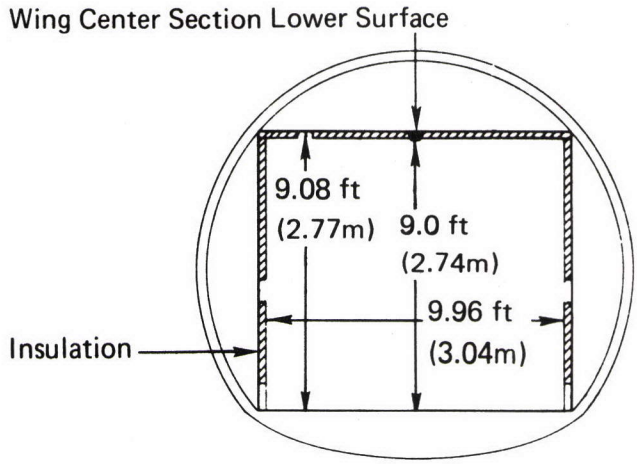
The floor design is compatible with the A/A-32H-4A Cargo Handling System for loading 463L cargo pallets and aerial delivery pallets. A train of five 463L pallets can be carried. An additional 463L pallet can be carried on the ramp. This arrangement is shown on page 15.

CARGO COMPARTMENT CROSS SECTIONS

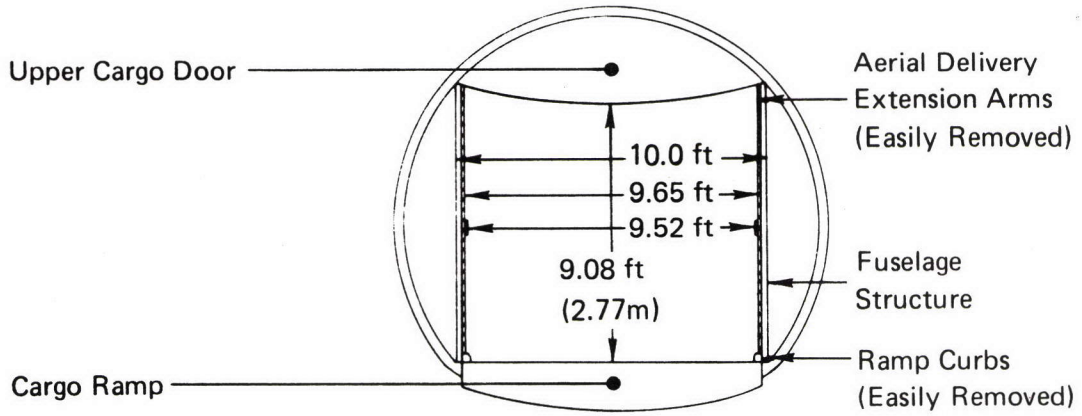




Section A-A

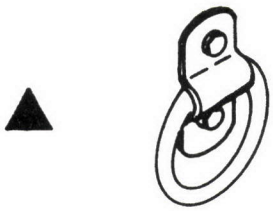


Section B-B



Section C-C

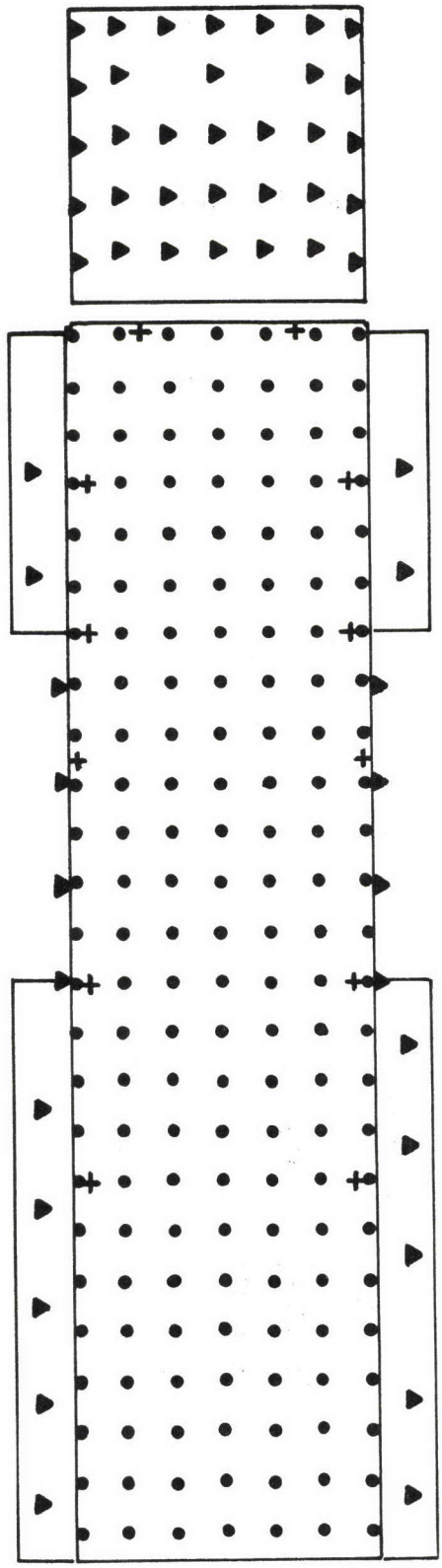
CARGO TIE-DOWN FITTINGS



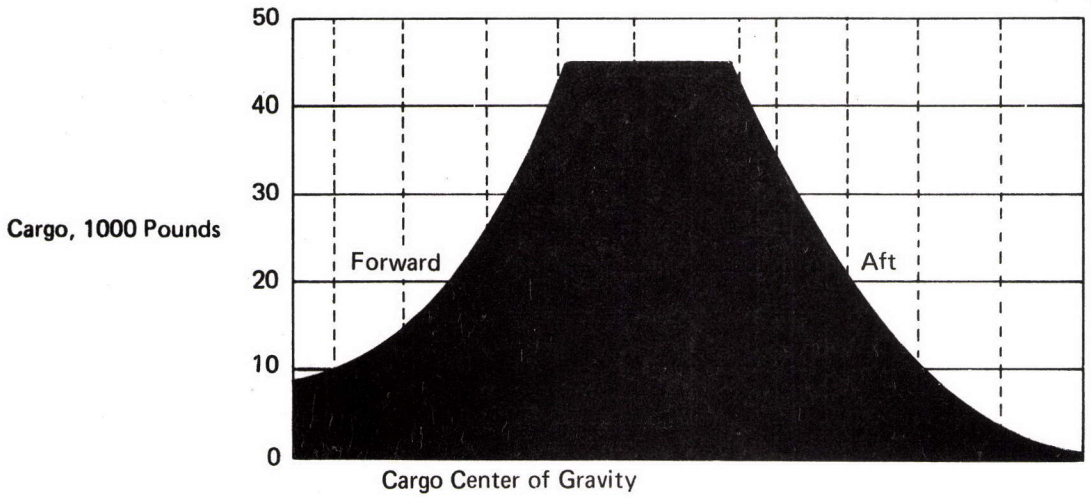
Fifty five 2268 kg (5,000 lb) capacity fittings are located on the compartment walls approximately 56 cm (22 in) above the cargo floor and on the ramp.

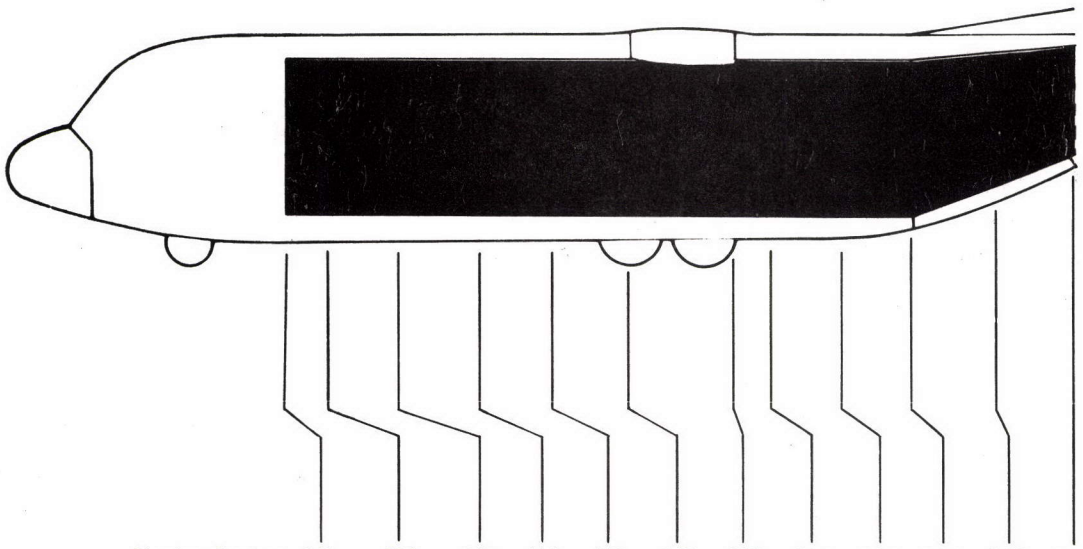
One hundred seventy-five 4536 kg (10,000 lb) capacity fittings form a 51 cm (20 in) grid pattern over the entire floor area.

Twelve 11,343 kg (25,000 lb) capacity fittings are located along the edges of the compartment floor as indicated on the right-hand plan.



CARGO COMPARTMENT LOAD LIMITS



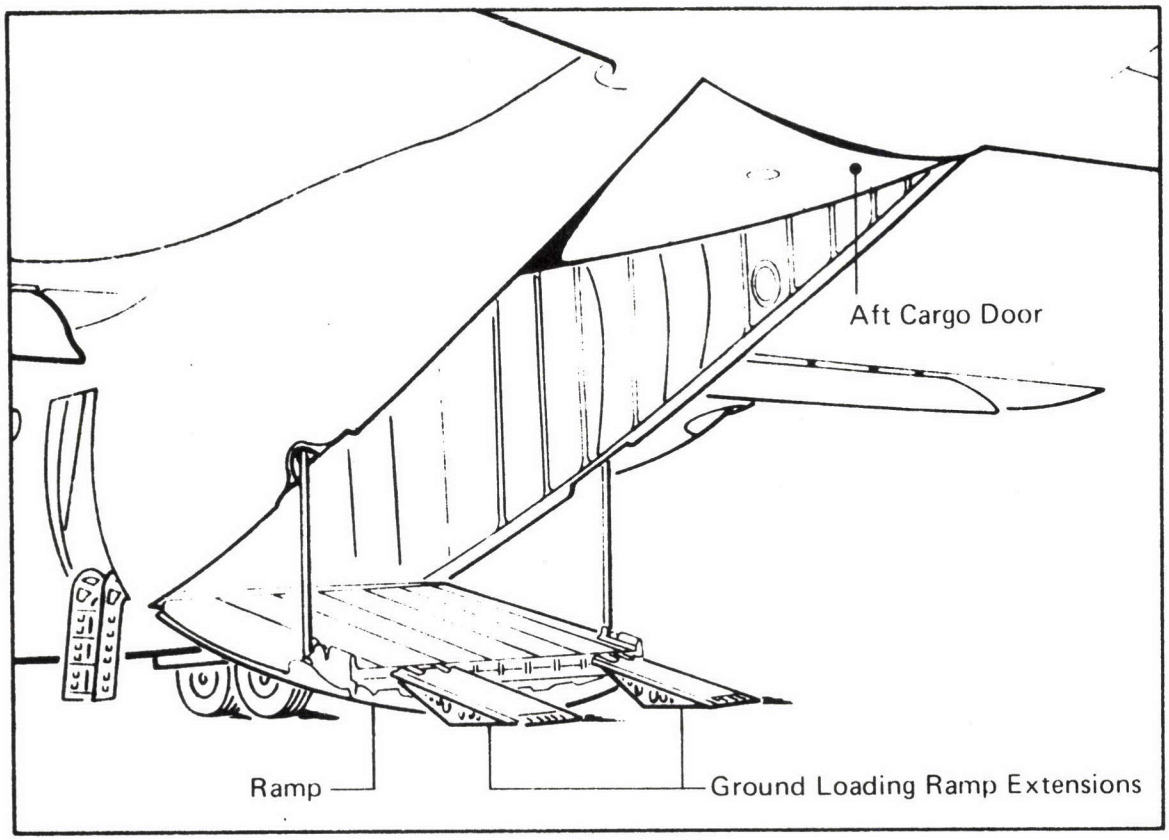


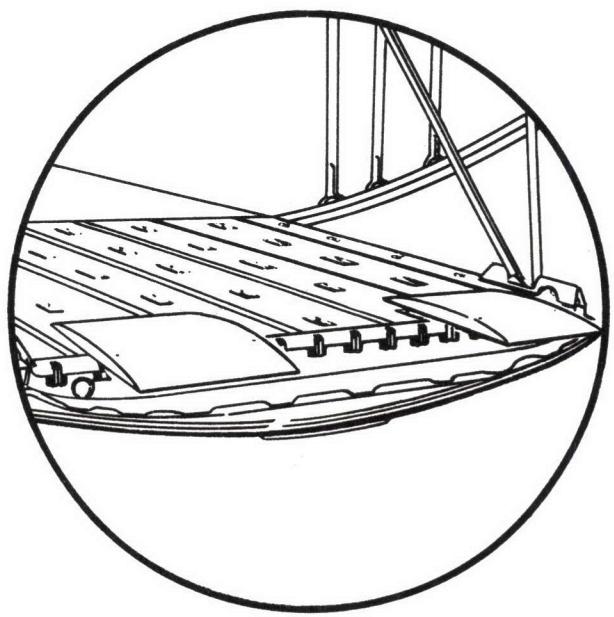
			Unit	C	D	E	F	G	H	I	J	K	L	M
1		Maximum Individual Compartment Capacity	LB	8400	12900	19500	28000	30000	40000	15000	24400	12700	2500	2500
2	Bulk Cargo	Concentrated Loads	PSI	50	50	50	50	50	50	50	50	50	50	50
		All Areas	PSF	7200	7200	7200	7200	7200	7200	7200	7200	7200	7200	7200
		Running Load Per Treadway ①	PSI	3.4	3.4	7.2	7.2	7.2	7.2	7.2	7.2	3.4	1.2	1.2
			LB/LIN FT	1400	1400	3000	3000	3000	3000	3000	3000	1400	500	500
		Running Load Between Treadways ①	PSI	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	1.3	1.3
			LB/LIN FT	1100	1100	1100	1100	1100	1100	1100	1100	1100	500	500
		Pneumatic Tires – 100 PSI Tire Pressure – Four Ft. Minimum Distance Between Axles												
3	Wheeled Cargo	Axle Load Treadways	LB	6000	6000	13000	13000	13000	13000	13000	13000	6000	2500	2500
		Axle Load Between Treadways	LB	5000	5000	5000	5000	5000	5000	5000	5000	5000	1200	1200
		Tongue Load Between Treadways ②	LB	2000	2000	2000	2000	2000	2000	2000	2000	2000	450	450
4		Palletized Cargo (4 Rail Conveyor System)	LB/LIN FT	2800	2800	3200	3200	3200	3200	3200	3200	2800	1000	1000

NOTE: ① Treadway Load Must Be Symmetrical About The Airplane Centerline. Treadway And Nontreadway Areas Must Not Be Loaded Simultaneously To Maximum Values Shown. Load Limits Between Treadways May Extend Over Entire Cargo Floor Width.

② Not to exceed 50 PSI

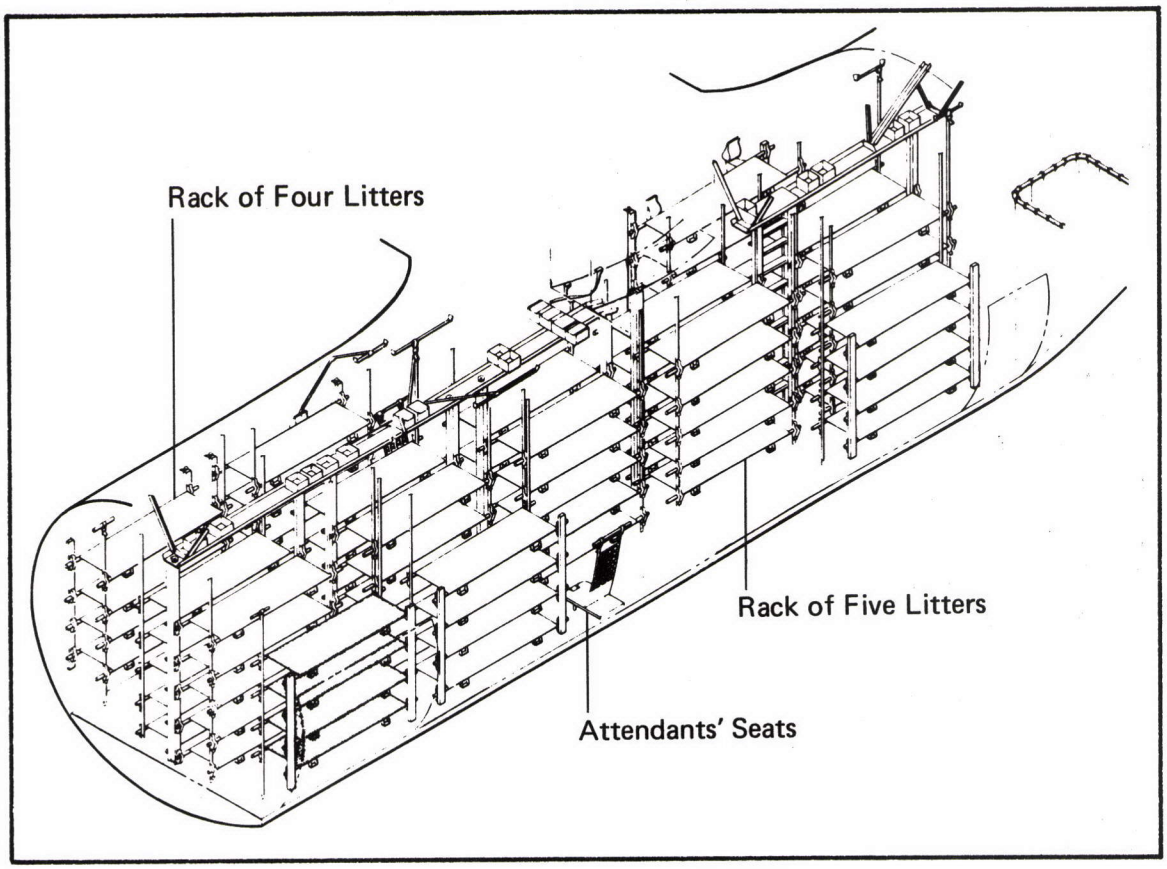
AFT RAMP AND CARGO DOOR



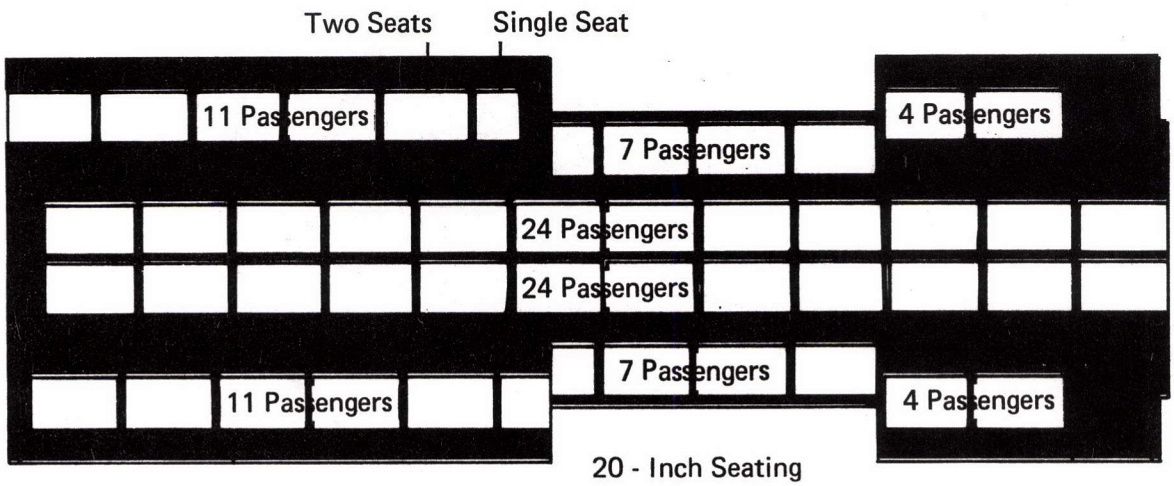


Ramp Bridge Plates

PERSONNEL LOADING

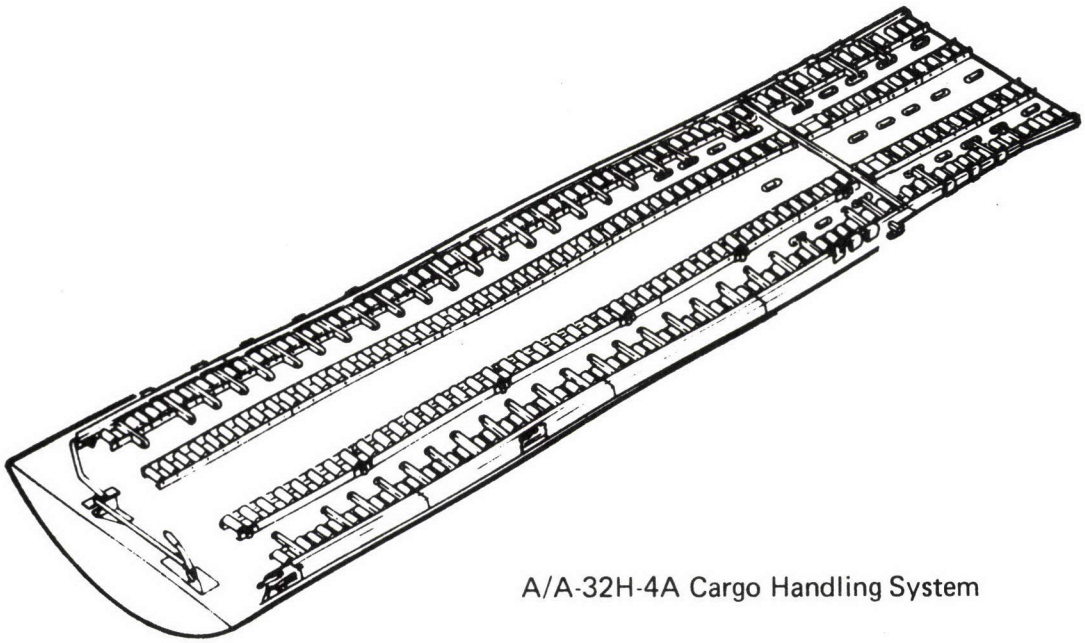


74 litters, 2 attendants



92 Passengers

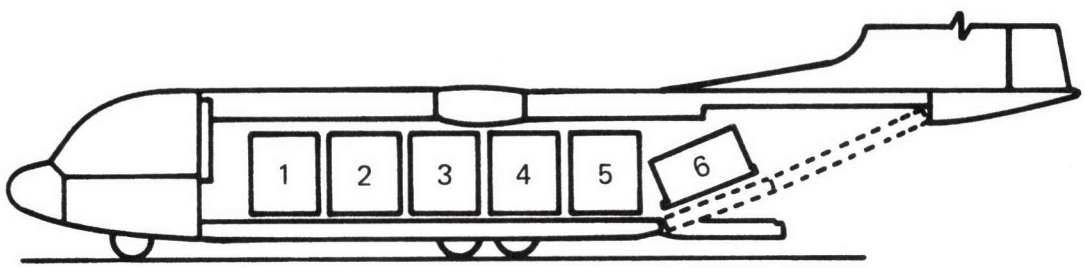
CARGO HANDLING SYSTEM AND PALLETIZED LOADING



A/A-32H-4A Cargo Handling System

Five 463L Pallets Plus Ramp Pallet

Palletized Loading

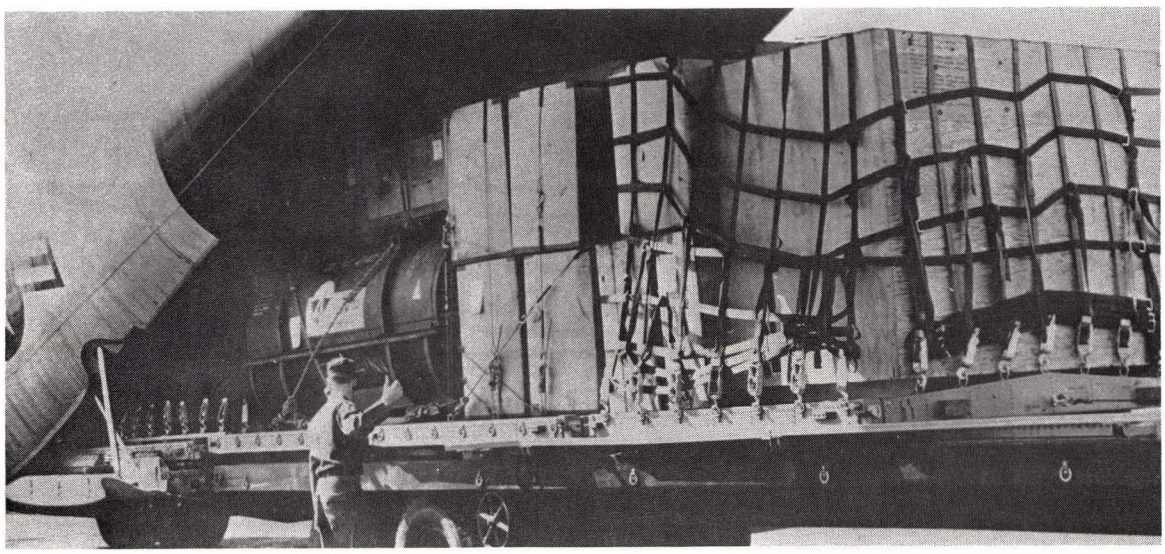


VEHICLE LOADING

Loading of vehicles is achieved by lowering the ramp to the ground and driving the vehicle directly into the airplane.

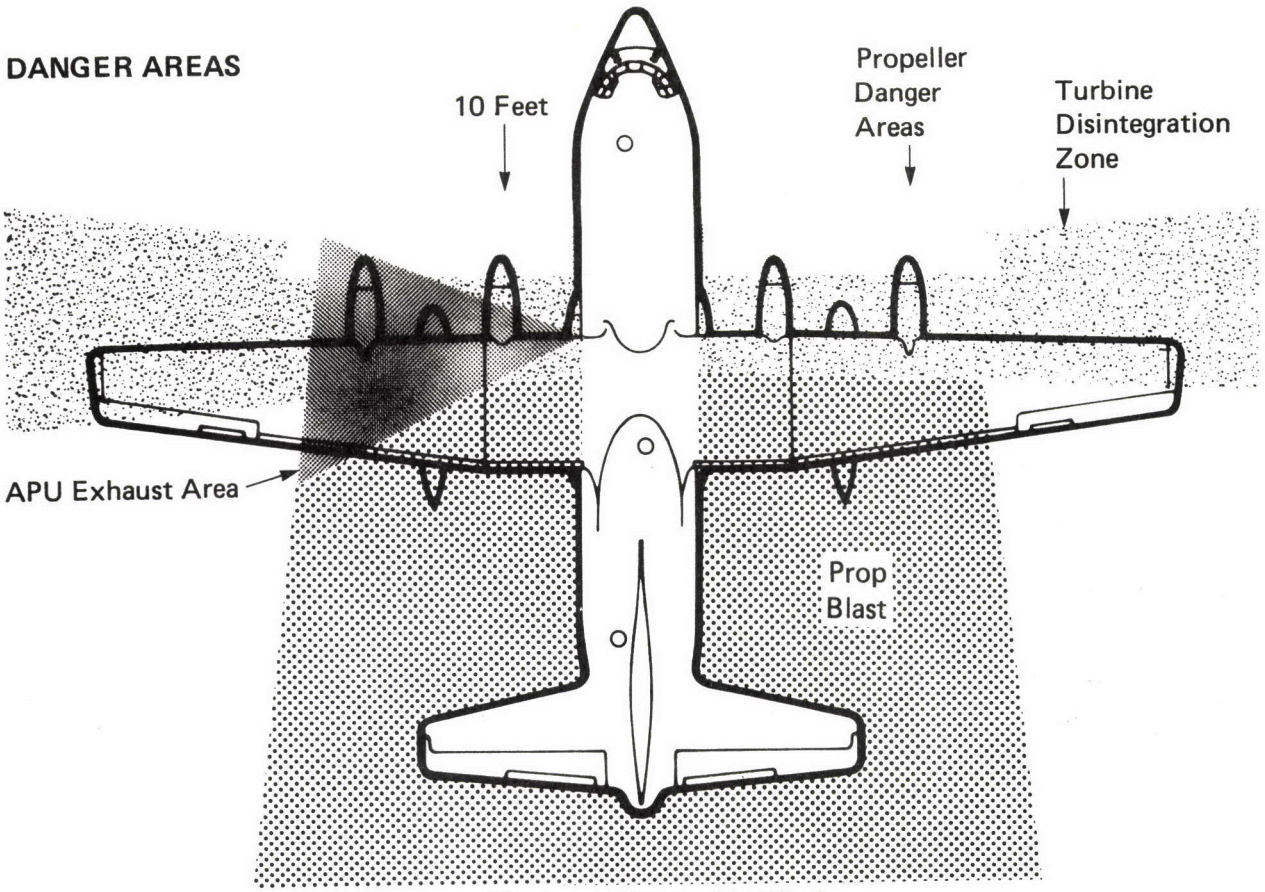
PALLETS FROM TRUCK BED OR FREIGHT DOCK

Because of its truck-bed height floor, the C-130H can be rapidly loaded or unloaded. When equipped with the A/A-32H-4A loading system and with the ramp in the horizontal position, pallets or containers are rapidly transferred from a "low boy" trailer or platform into the airplane. Standard "8 x 8" containers up to 40 feet long can be loaded into a Hercules.



2
Airport Operations

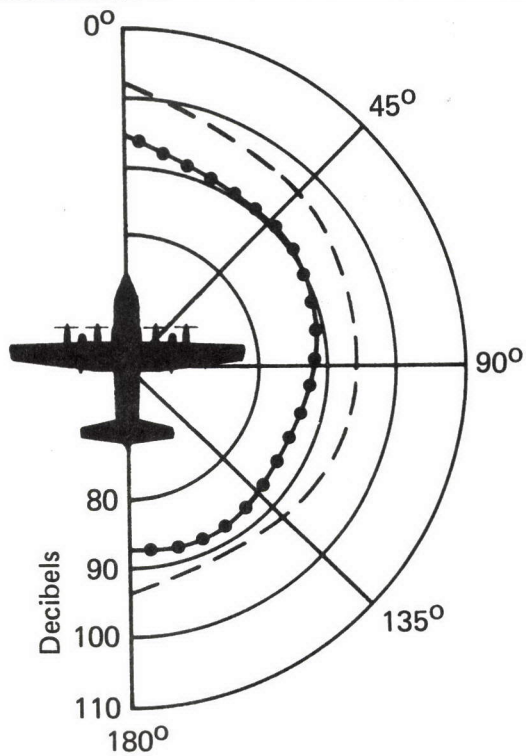
DANGER AREAS



Maximum Power, No Wind

Distance Aft of Prop – Feet	100	200	300	400	500
Wake Velocity – Knots	128	107	92	80	69

EXTERNAL SOUND LEVELS



Ground Operations

200 Feet from Aircraft
Static Conditions, 4 Engines

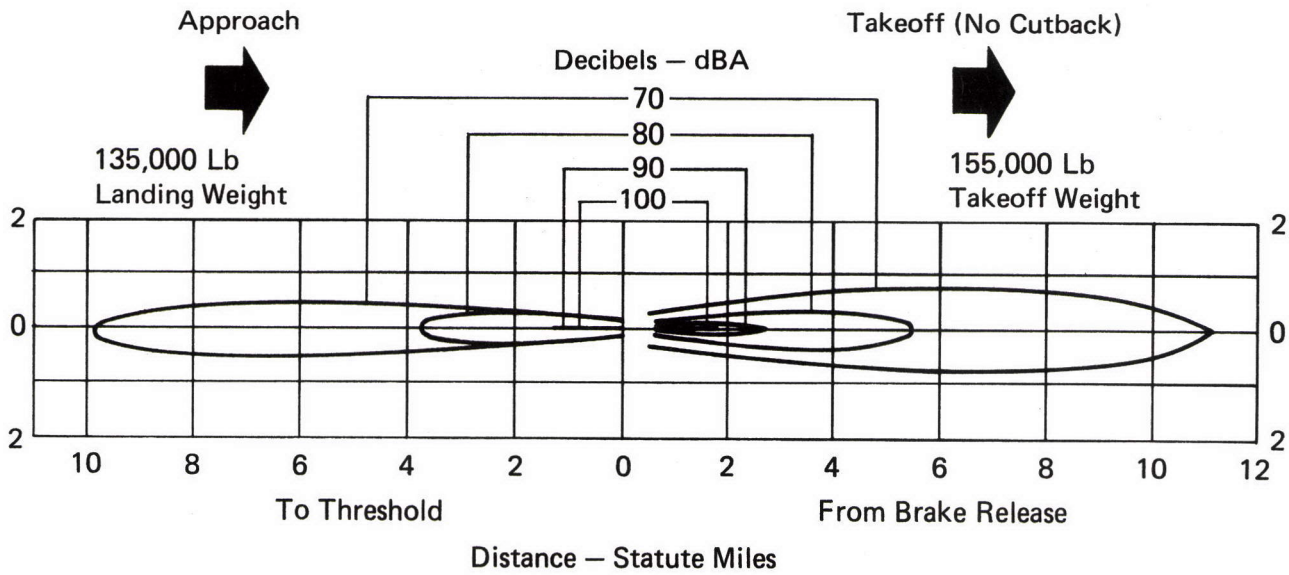
—●—● Low Speed Ground Idle (10,000 RPM)
— — — High Speed Ground Idle (13,820 RPM)

EXTERNAL SOUND LEVEL

In-Flight Noise Prints

A – Weighted Noise Levels – dBA

The noise print data shown below in terms of A–weighted decibels were developed from test data obtained during the certification tests of the Hercules airplanes.



Perceived Noise Levels – EPNdB

The C-130H has demonstrated compliance with FAR Part 36 as well as with ICAO Annex 16 noise standards. The current compliance with the Stage 2 requirements of FAR 36 is listed below in addition to estimated compliance with the predicted requirements of Stage 3. The measured EPNdB values shown were obtained for maximum takeoff weight (155,000 pounds) and for the maximum landing weight (135,000 pounds) for the commercially certificated version of the C-130H. Compliance with FAR Part 36 is indicated when the sum of the margins for each stage is negative.

	Measured Values EPNdB	FAR 36 Stage 2 Limit	Margin	FAR 36 Stage 3 Limit	Margin
Takeoff Sideline	94.7	104.1	–9.4	96.6	–1.9
Takeoff Flyover					
Takeoff Power	97.8	98.2	–0.4	96.2	1.6
Cutback Power	94.8	98.2	–3.4	96.2	–1.4
Approach Flyover	98.4	104.1	–5.7	100.4	–2.0

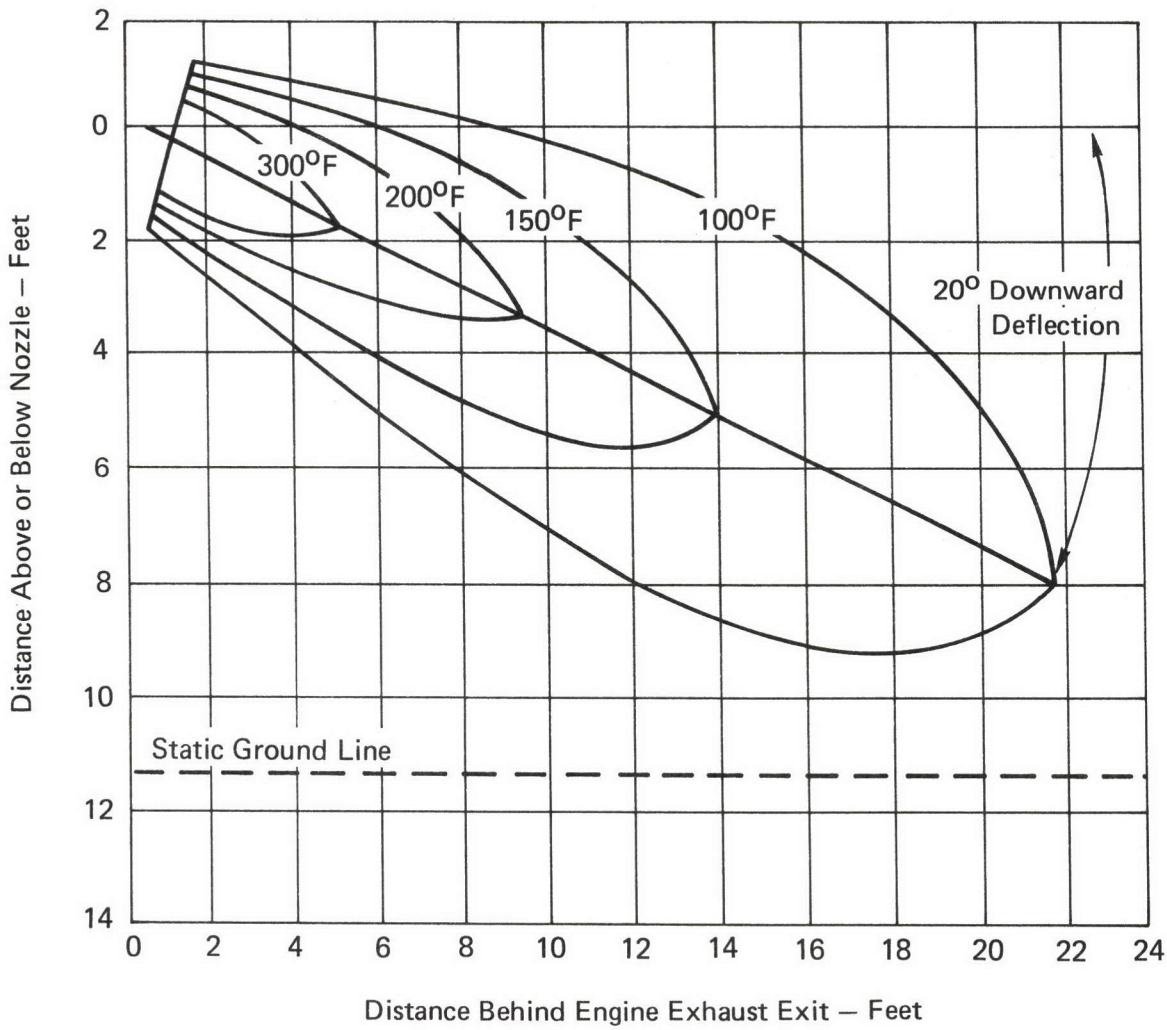
INTERIOR NOISE LEVELS

Passenger and crew exposure to noise was a fundamental design consideration. Soundproofing, vibration isolation, and other noise control design features are built into the C-130H. As a result, actual noise surveys have shown that the noise levels inside the airplane are below the maximum allowable loads.

EXHAUST GAS TEMPERATURE DISTRIBUTION

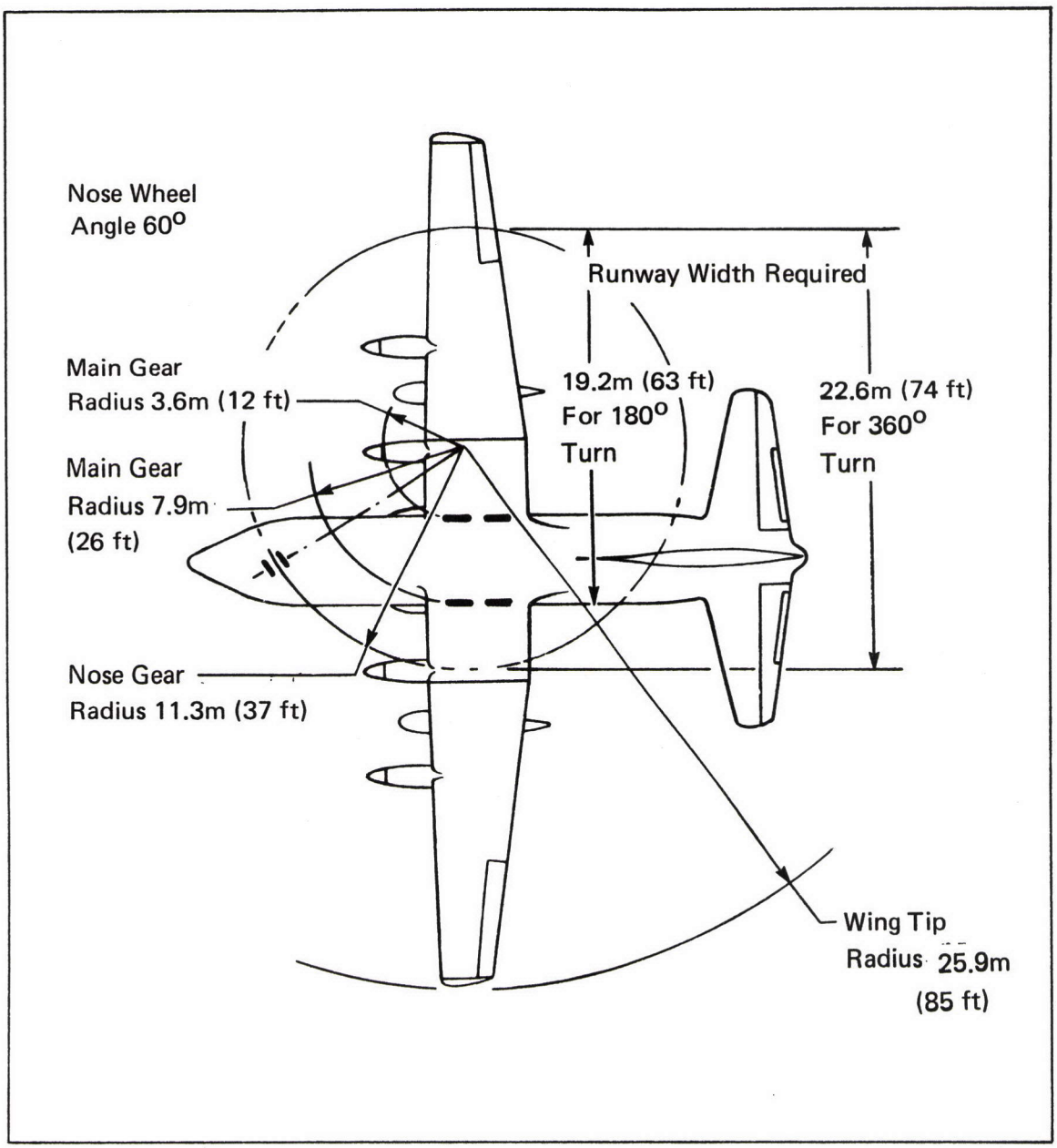
Ground Idle

The chart of exhaust gas temperature dispersion shows the distribution pattern and temperature change with distance behind the tailpipe exit and the engines set in high-speed ground idle. The tailpipe end is deflected 20° downward, and the resulting jet wake pattern is shown in relation to the aircraft static ground line. As the airplane is taxiing, the wake will be extended but the temperatures will be lowered because of the increased mixing effect of ambient air.

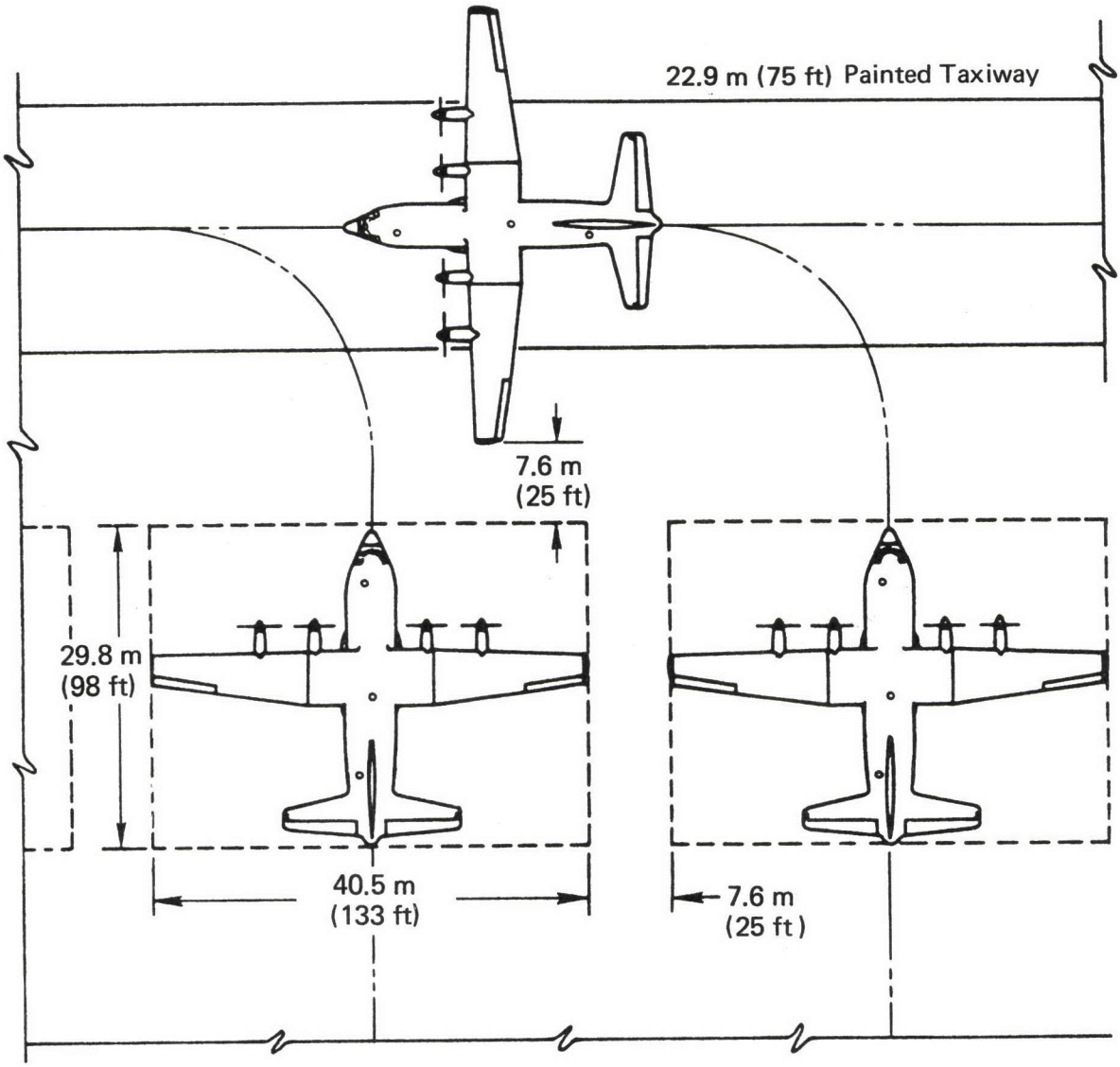


GROUND MANEUVERING - TURNING RADII

The ground handling characteristics of the C-130 are suitable for almost any existing airport. The nose landing gear is equipped with hydraulic power steering and can be turned through 60^{o} each side of center. Minimum turning radii described by various airframe elements at maximum nose wheel deflection are shown in the diagram below. The smallest runway width required for a full reversal of direction is 19.2 meters (63 feet). The four reversible pitch propellers provide the airplane with the capability to back up into or out of a tight parking situation.

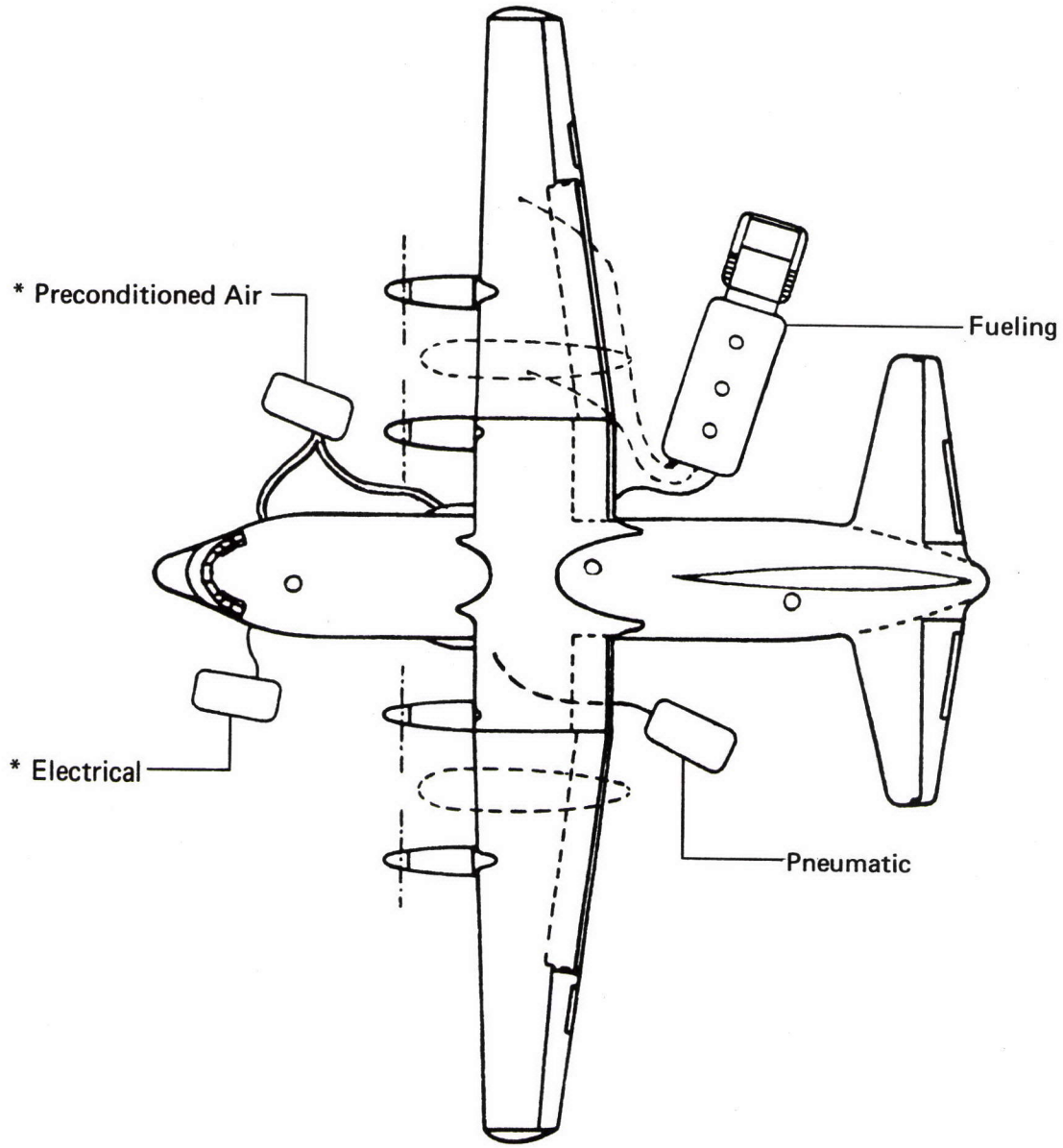


PARKING SPACE



These dimensions are for typical commerical operation. Military operational limits are known to vary.

TERMINAL SERVICING



* Can be used for ground check-out of aircraft system

RUNWAY/AIRFIELD STRENGTH

The information on pages 23 thru 32 is presented for the computation or derivation of runway, parking ramp, and airfield strengths required for operation of the C-130H. The basic dimensional and physical characteristics of the landing gear, wheels, and tires are shown on page 24. The maximum vertical and horizontal loads on the ground or pavement for static and braking conditions are shown on page 25. The percentages of total weight on the main landing gear for various center of gravity locations and gross weights are shown on page 26.

These basic data are used to determine the pavement thicknesses from the pavement design charts which are included on pages 27 thru 30.

Flexible (Asphalt) Pavement The flexible pavement design chart shown on page 27 is based on the format and procedures set forth by the U.S. Army Engineers and described in USAF document SEFL Report No. 165A, dated February 1965. The pavement thicknesses derived from the chart are those for unlimited operation of the C-130H.

Rigid (Concrete) Pavement The rigid pavement design chart on page 28 was prepared using the Westergaard equations in accordance with procedures published by the Portland Cement Association. These data were computed using 6.8 kg/sq cm (96 lb/sq in) inflation pressure in the main landing gear tires of the C-130H.

Load Classification Number (LCN) LCN conversion charts are shown on page 29 for flexible pavements and on page 30 for rigid pavements. These LCN charts were developed using the method described in ICAO Aerodrome Manual, Part 2, paragraph 4.1.3.

Unpaved Airfield Surfaces Test

For operation from unpaved airfield surfaces (runways) it is common practice to reduce tire inflation pressure (increase tire deflection) in order to improve flotation. Main gear inflation pressures can be reduced to not exceed 39 percent tire deflection as shown on page 24. Nose gear inflation pressure is not reduced.

The chart shown on page 31 was developed from soil strength data obtained by the U.S. Army Engineer Waterways Experiment Station. The computations for number of passes were made using the passes to coverage ratios applicable to the C-130H airplane. In one example shown, the C-130H, at 140,000 pounds gross weight and 96 psi (normal) inflation pressure, can make 700 passes on a California Bearing Ratio (CBR) 10 airfield or runway surface. Another example shows that the C-130H, at 80,000 pounds gross weight and a reduced tire pressure of 55 psi, can make about 300 passes on a CBR 4 airfield surface. One landing and one takeoff constitute one pass.

Surface Roughness

The degree of surface roughness is often an important factor in determining the compatibility of the C-130H with a runway/airfield. The tabulations on page 32 are presented in the C-130H airplane flight manual to be used as a guide to estimate this compatibility. The roughness characteristics are those established by USAF during the design of the C-130H. The landing and takeoff weight limitations shown are based on test data.

RUNWAY/AIRFIELD WHEEL LOADS

Paved Runways — Main Gear — Normal (32%) Deflection

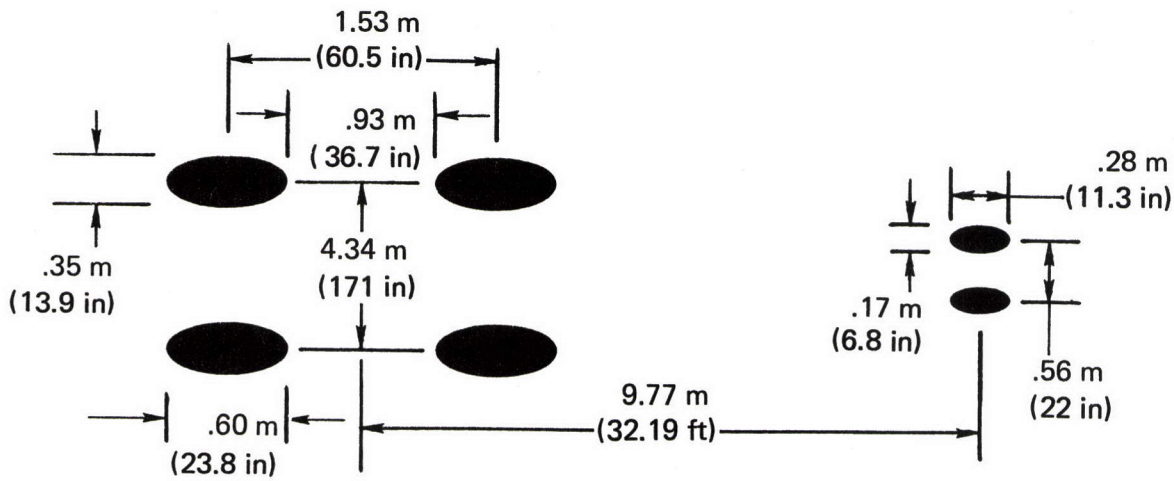
Gross Weight		Tire Inflation Pressure		Tire Contact Area	
kg	lb	kg/sq cm	lb/sq in	sq cm	sq in
70,295	155,000	6.8	96	2516	390
58,960	130,000	5.6	79	2516	390
45,354	100,000	4.2	59	2516	390

Unpaved Runways — Main Gear — Maximum (39%) Deflection

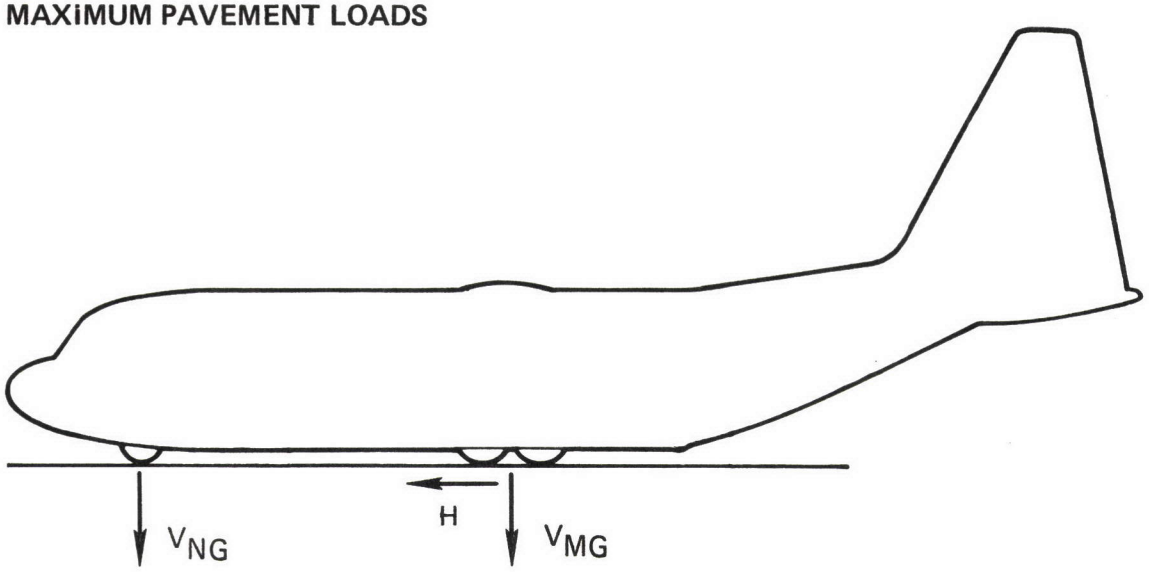
Gross Weight		Tire Inflation Pressure		Tire Contact Area	
kg	lb	kg/sq cm	lb/sq in	sq cm	sq in
70,295	155,000	5.3	75	3225	500
58,960	130,000	4.3	61	3225	500
45,354	100,000	3.2	45	3225	500

Nose Gear Inflation — 4.3 kg/sq. cm. (60 lb/sq in) at all weights
Tire Sizes: Main 56 x 20.0 –20, Nose 39 x 13

Footprint Geometry (32% Deflection)



MAXIMUM PAVEMENT LOADS



MODEL	GROSS WEIGHT	V_{NG} STATIC AT MOST FORWARD C.G.		V_{NG} STATIC + BRAKING 12 FT/SEC^2 DECEL		V_{MG} (PER SIDE) MAXIMUM LOAD OCCURING AT STATIC AFT C.G.		H (PER SIDE) AT STEADY BRAKING 12 FT/SEC^2 DECEL.		H (PER SIDE) AT INSTANTANEOUS BRAKING ON DRY PAVEMENT (COEFF. OF FRICTION 0.8)	
	LB	LB	KG	LB	KG	LB	KG	LB	KG	LB	KG
C-130H	155,000	10,450	4,740	29,800	13,520	74,500	33,800	27,720	12,600	59,600	27,000

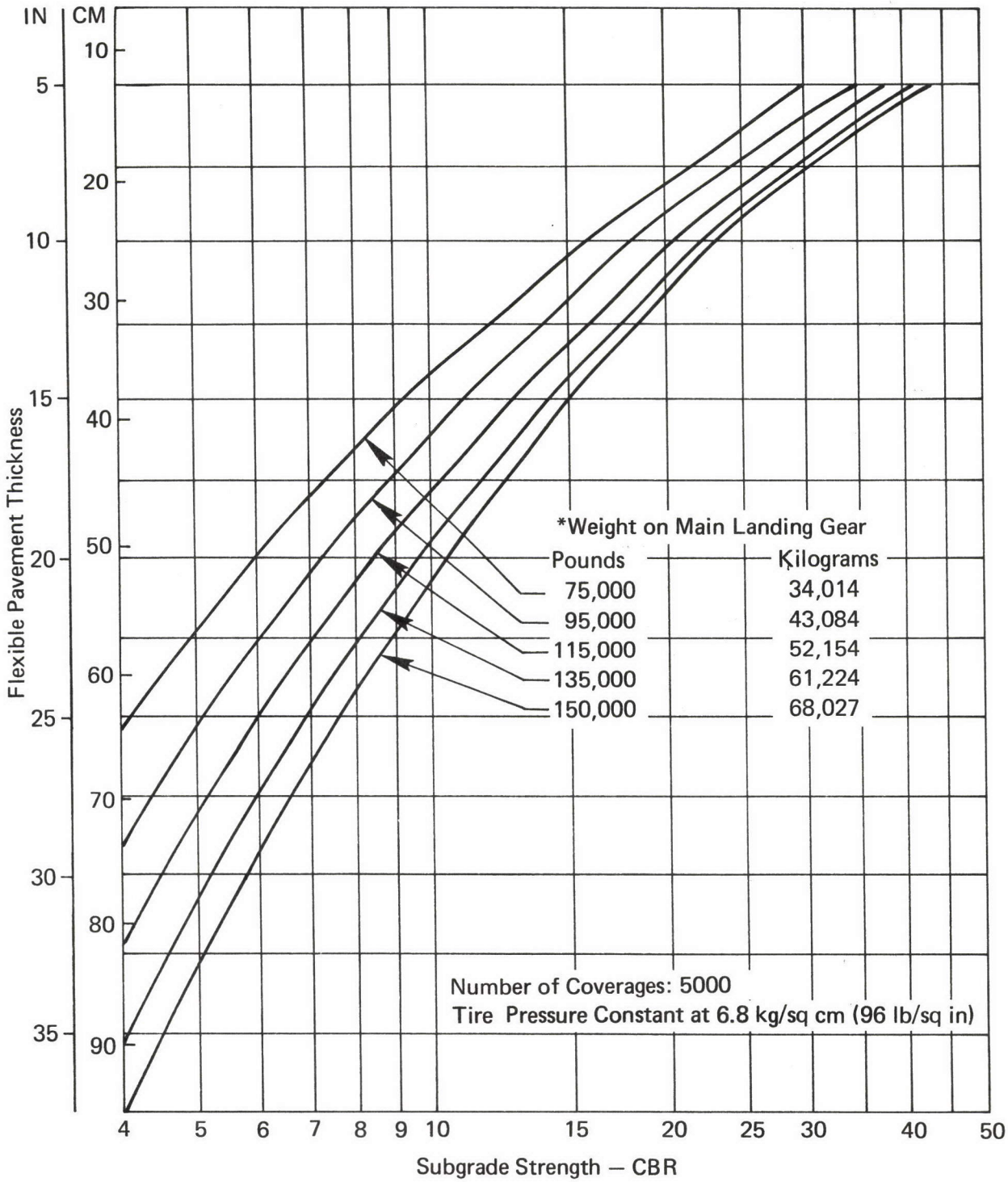
LEGEND:

V_{NG} = MAXIMUM VERTICAL NOSE GEAR GROUND LOAD AT MOST FORWARD C.G.

V_{MG} = MAXIMUM VERTICAL MAIN GEAR GROUND LOAD AT MOST AFT C.G.

H = MAXIMUM HORIZONTAL GROUND LOAD FROM BRAKING

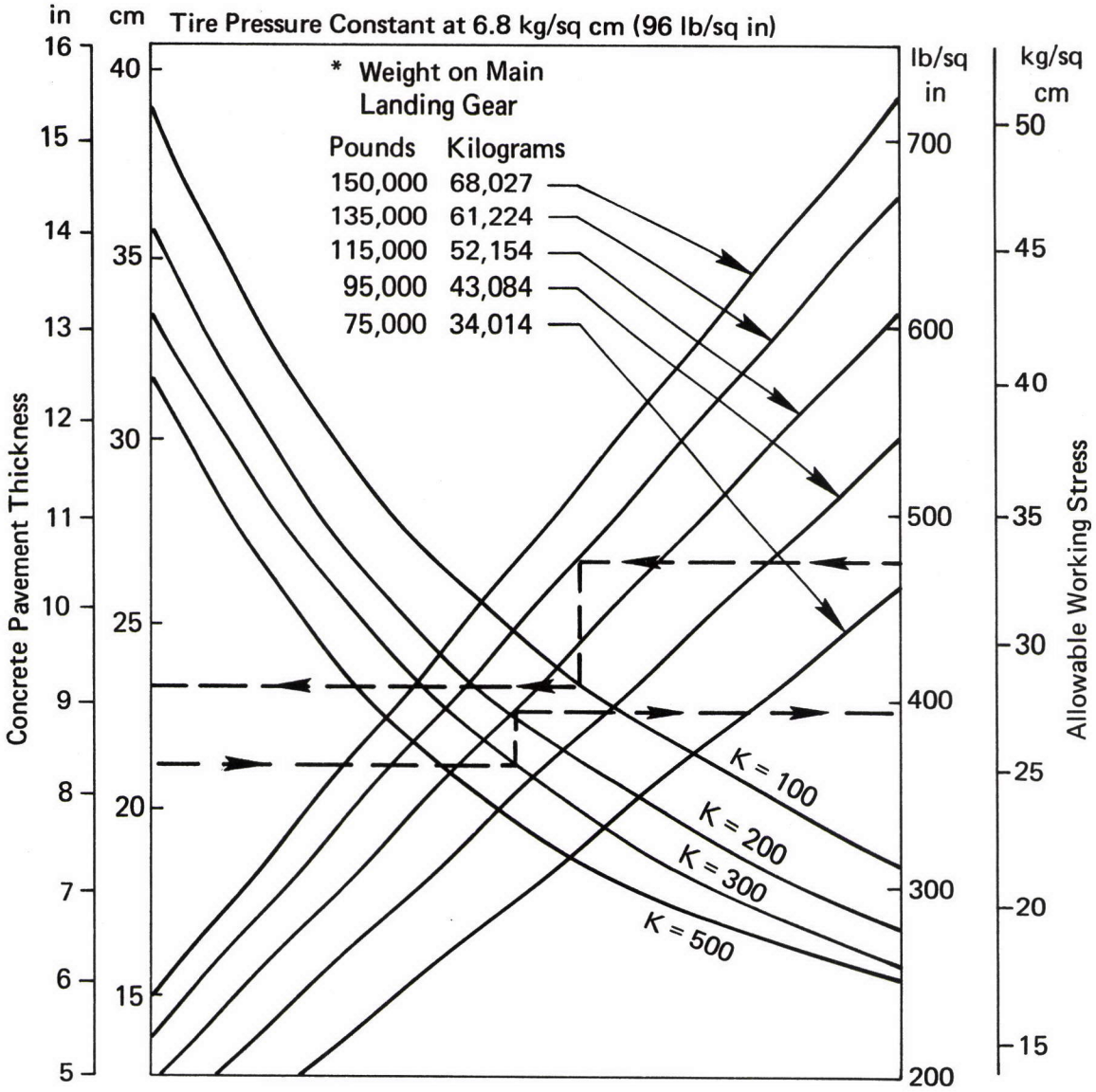
ASPHALT PAVEMENT THICKNESS



These data derived by U. S. Army Engineers design method (Ref. SEFL 165A).

* Refer to page 26 for computation of aircraft gross weights.

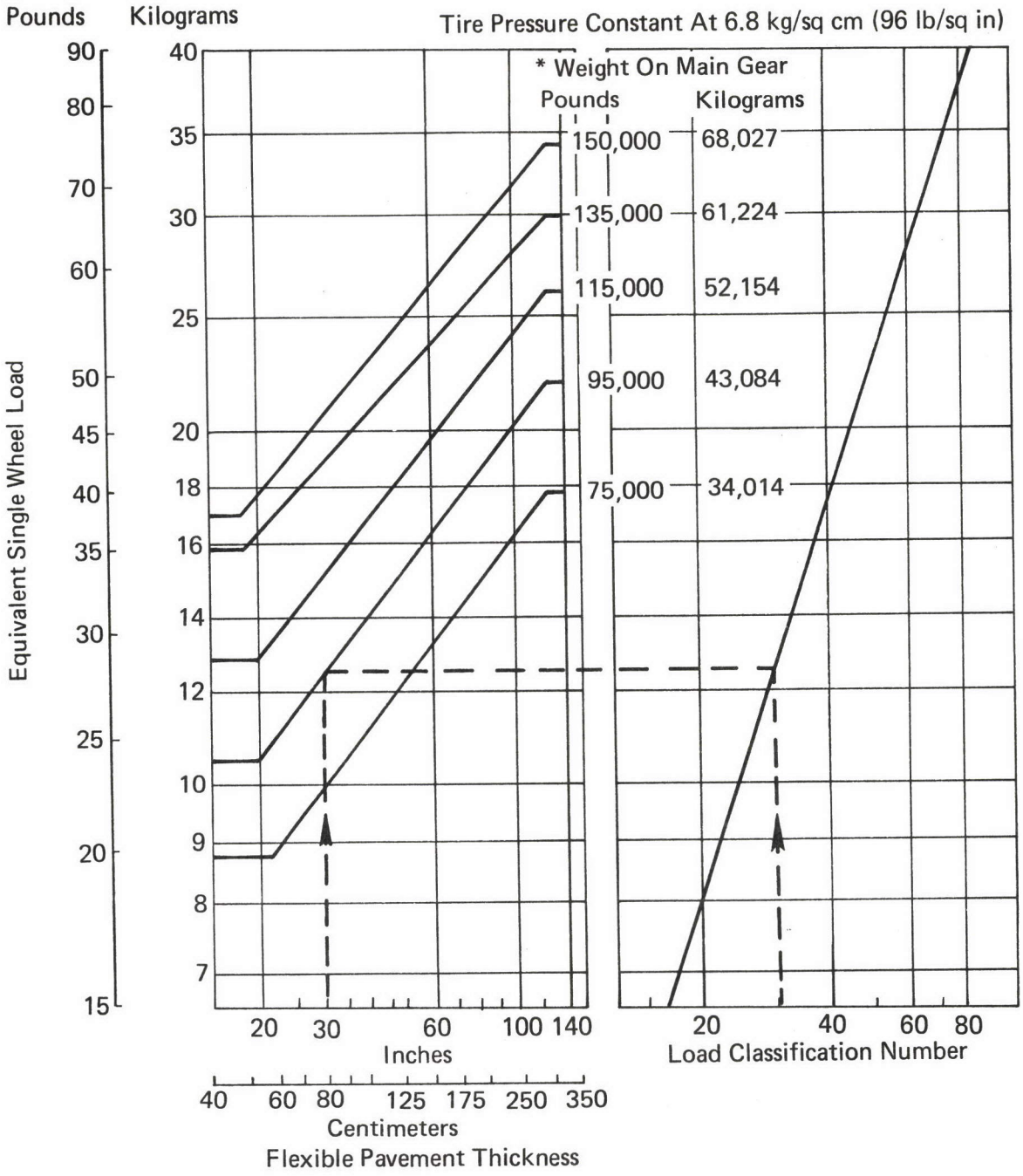
CONCRETE PAVEMENT THICKNESS



*See page 26 for computation of airplane gross weight.

Reference:
"Design of Concrete Airport Pavement" and "Computer Program for Airport Pavement Design" (Program PDILB), Portland Cement Assn.

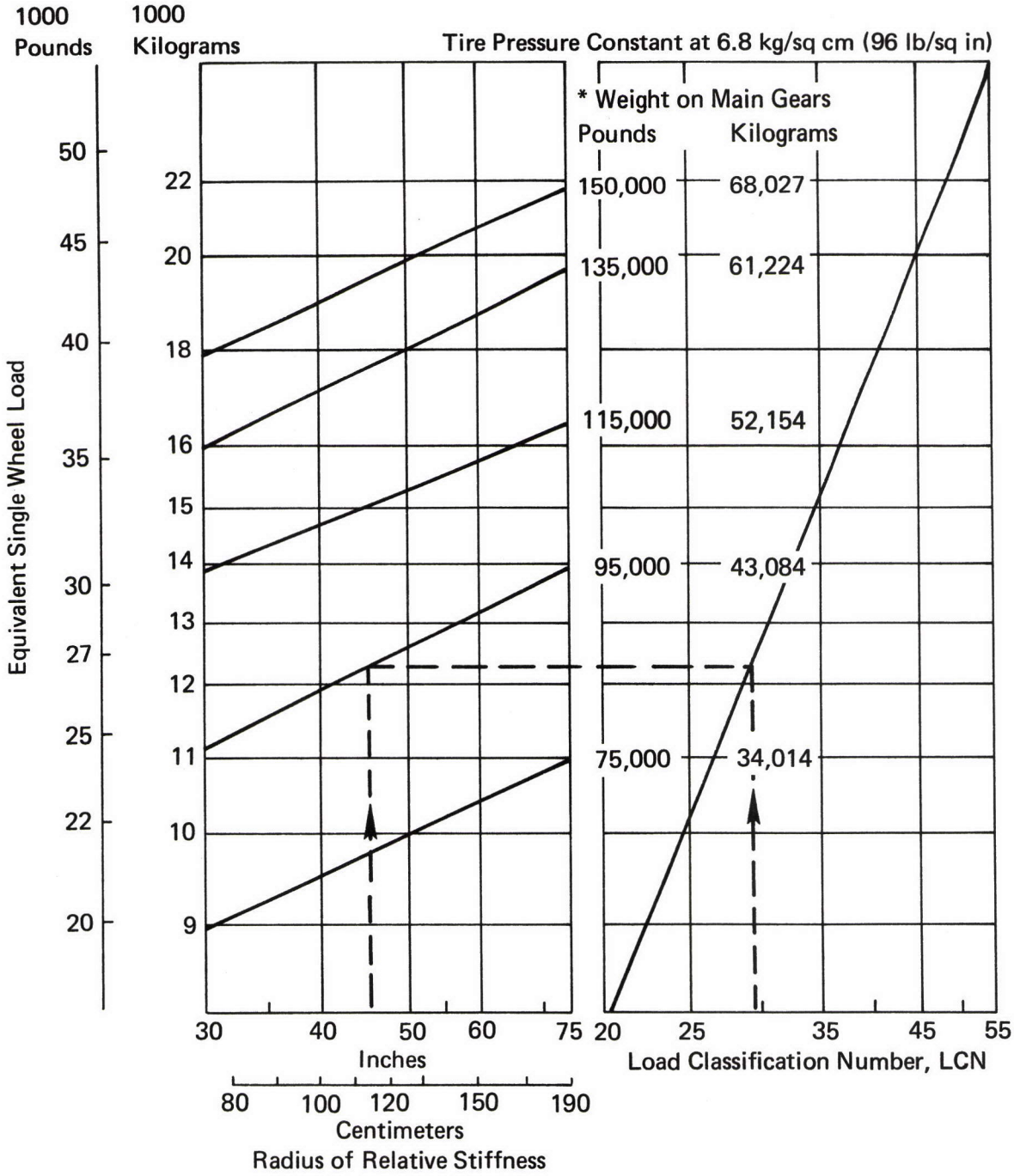
LCN CONVERSION – ASPHALT PAVEMENTS



* See page 26 for computation of airplane gross weight.

Equivalent single wheel load derived by methods shown in ICAO aerodrome manual, part 2, par. 4.1.3.

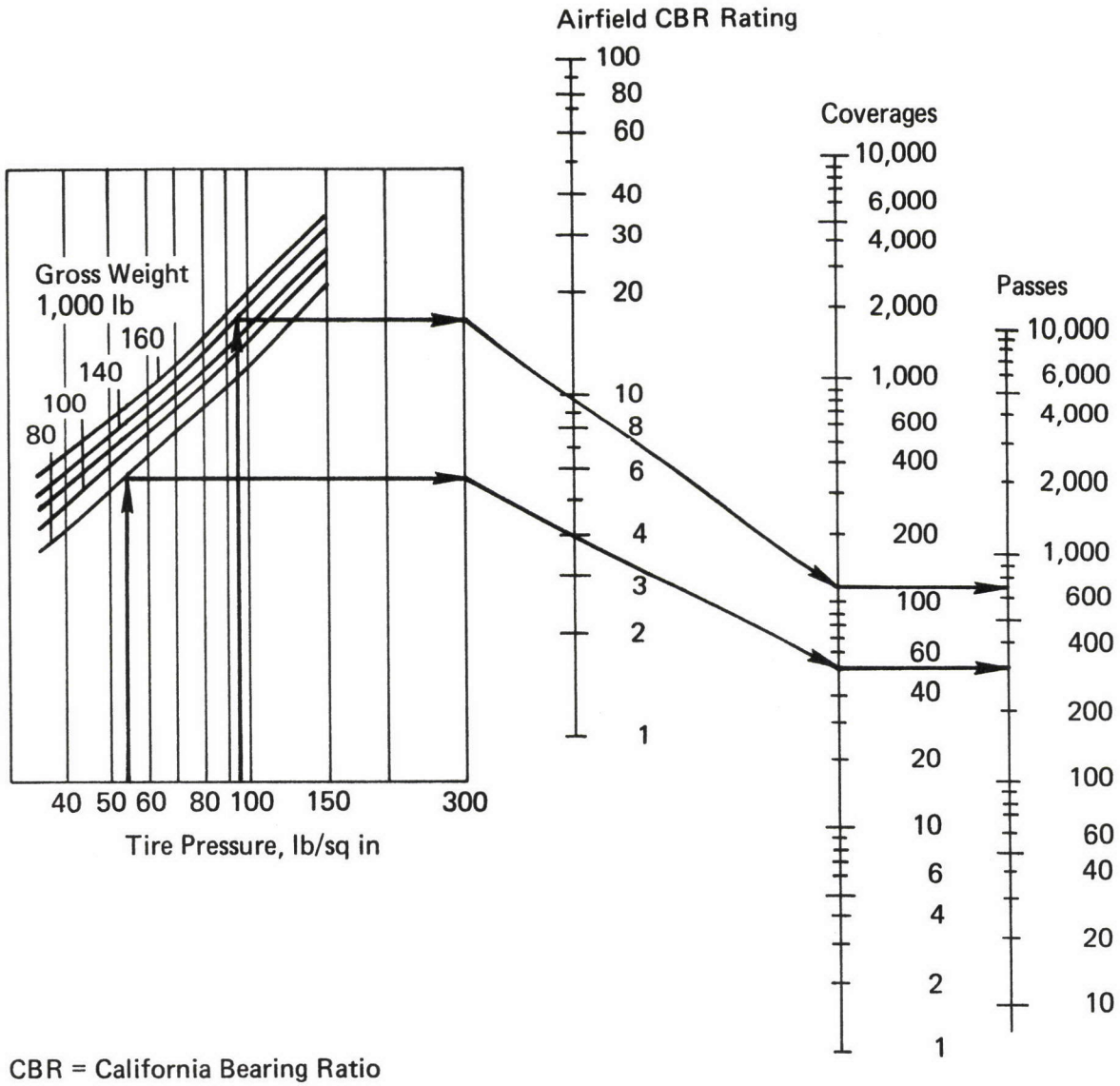
LCN CONVERSION – CONCRETE PAVEMENT



* See Page 26 for computation of airplane gross weight

Equivalent single wheel load derived by methods shown in ICAO aerodrome manual, part 2, par. 4.1.3.

UNPAVED AIRFIELDS



CBR = California Bearing Ratio
Pass = One Landing and One Takeoff

RUNWAY/AIRFIELD ROUGHNESS

The following table explains roughness characteristics which impose certain gross weight and fuel weight restrictions for operations on substandard airfields.

Parameter	Roughness Characteristics		
	A-Emergency (No Preparation or Maintenance)	B-Intermediate (Maintained Only as Necessary)	C-Smooth (Regularly Maintained)
Deviation From Surrounding Surface Level	±6 Inches In 25 Feet	± 4 Inches In 25 Feet	± 2 Inches In 50 Feet
Maximum Gradient Longitudinal Transverse	± 6% ± 3%	±4% ± 3%	± 2% ± 2%
Maximum Change In Longitudinal Elevation	3 Ft In 100 Ft 6 Ft In 200 Ft 10 Ft In 400 Ft 2% Over 400 Ft	3 Ft In 100 Ft 6 Ft In 200 Ft 10 Ft In 400 Ft 2% Over 400 Ft	2 Ft In 100 Ft 4 Ft In 200 Ft 8 Ft In 400 Ft 2% Over 400 Ft
Maximum Change In Gradient	4% In Any 50 Ft Length	3% In Any 50 Ft Length	2% In Any 50 Ft Length
Maximum Allowable Rutting (Measured From Surrounding Surface — Not Edges of Rut)	6 In	4 In	2 In
Solid Objects Projecting From Surface	6 In From Undisturbed Surface	3 In From Firm Or Undisturbed Surface	None
Pot Holes or Depressions	8 In Depth, 2 Ft Max Dia.	6 In Depth, 15 In Max Dia; 4 In Depth, Any Dia	2 In Depth Maximum For All Diameters
Loose Or Soft	As Needed To Fill Ditches Or Holes. Pack With Feet Or Or Use Hand Tamper	None Adjacent To Rocks, Stumps, Or Rigid Surfaces	None

LANDING AND TAKEOFF WEIGHT LIMITATIONS

Roughness Characteristics	A		B		C	
	RECM	Allowable With Caution	RECM	Allowable With Caution	RECM	Allowable With Caution
Landing Gross Wt (Lb)	———	111,000 /2\	120,000	———	130,000 /1\	155,000 /3\
Landing Fuel (Lb)	———		20,250	———	20,250 /1\	45,240 /3\
Take-Off Gross Wt (Lb)	———	111,000	120,000	135,000	155,000	———
Take-Off Fuel (Lb)	———		20,250	45,240	45,240	———

/1\ Maximum 2000 Lb Fuel In Outboard Tanks

/2\ Maximum Rate Of Sink 9 Feet Per Second

/3\ Maximum Rate of Sink 6 Feet Per Second

3

Aerial Delivery

AERIAL DELIVERY APPLICATIONS

The aerial delivery of material, supplies, and equipment is efficiently accomplished by the C-130H. The aft ramp and door system can be opened in flight and aerial deliveries can be made by exiting the items either manually or by parachutes combined with the mechanical cargo loading/aerial delivery system shown on page 15.

The mechanical aerial delivery system, A/A-32H-4A, originally was developed for military applications, but also can be used effectively for a variety of commercial or civil applications. There are five types of military aerial delivery techniques. These are Airdrop, Ground Proximity Extraction System (GPES), Low Altitude Parachute Extraction System (LAPES), Parachute Low Altitude Delivery System (PLADS), and Container Delivery System (CDS). Each of these systems is described in brief detail in subsequent paragraphs.

Some of the non-military uses of Hercules airdrop capabilities are feeding marrooned cattle, relief of stranded flood or disaster victims, iceberg tracking, and forest fire fighting.

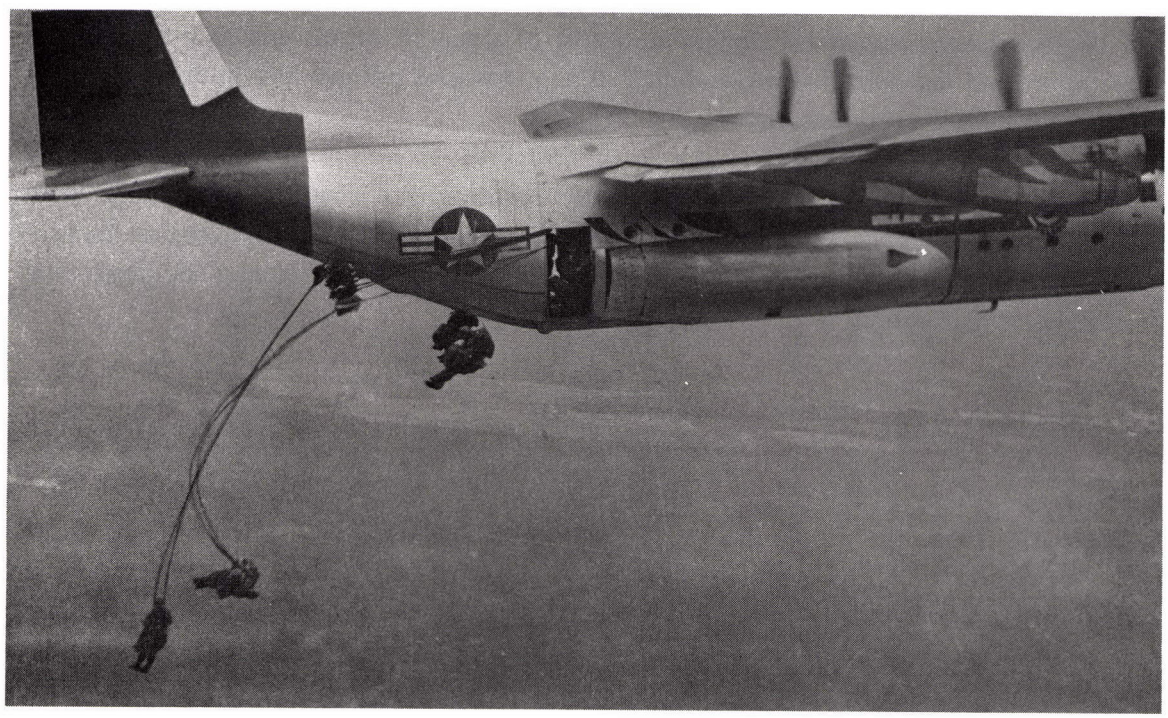
Airdrops - Normal

The USAF and other military operators of Hercules airplanes have perfected airdropping of military personnel, supplies and equipment to a high degree. The flight technique for airdrops is easily accomplished in Hercules airplanes. Airdrops can be made at any normal cruise altitude, but usually are made at 366 to 457 meters (1200 to 1500 feet) and at 115 knots to 150 knots indicated airspeed. This low altitude, low speed technique results in a high degree of accuracy and a minimum degree of dispersal in the landing area. The fast acceleration and excellent maneuverability of the Hercules permits the pilot to leave the drop zone area in the shortest time.

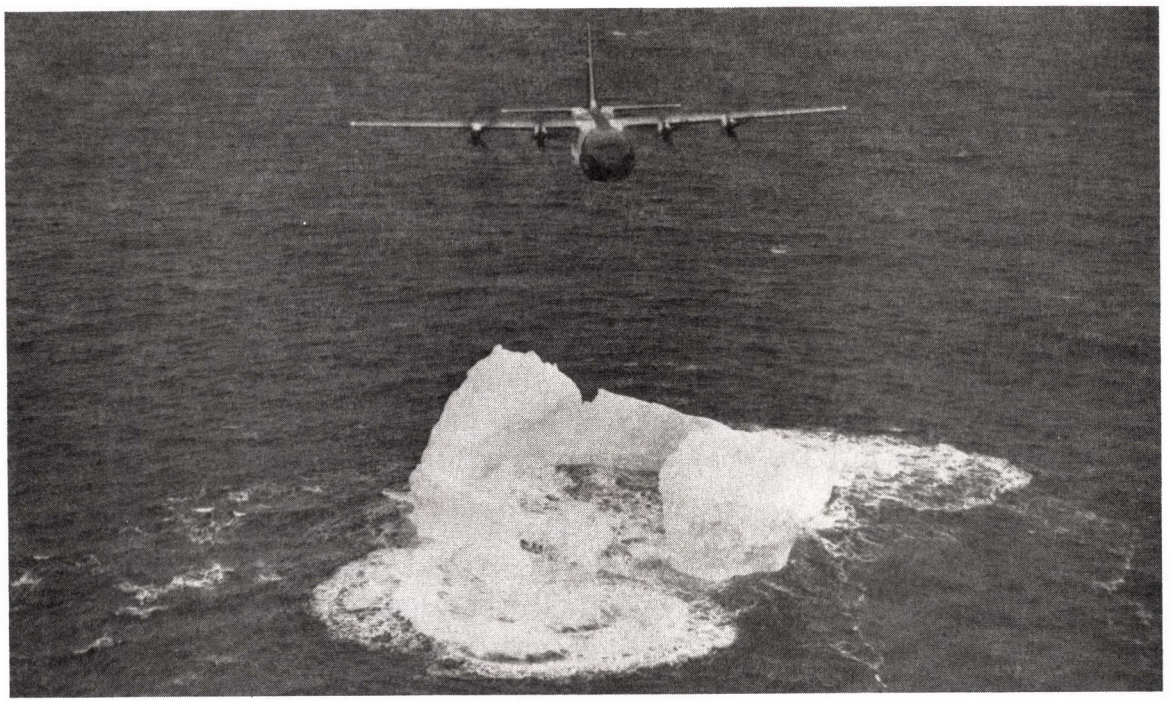
The C-130H can airdrop a maximum of either 64 paratroops or single palletized cargo loads of more than 18,144 kilograms (40,000 lb). It is also possible to drop combination loads of paratroops and equipment with the equipment exiting over the ramp and the paratroops exiting the aft side doors.

AIRDROP OF HEAVY EQUIPMENT

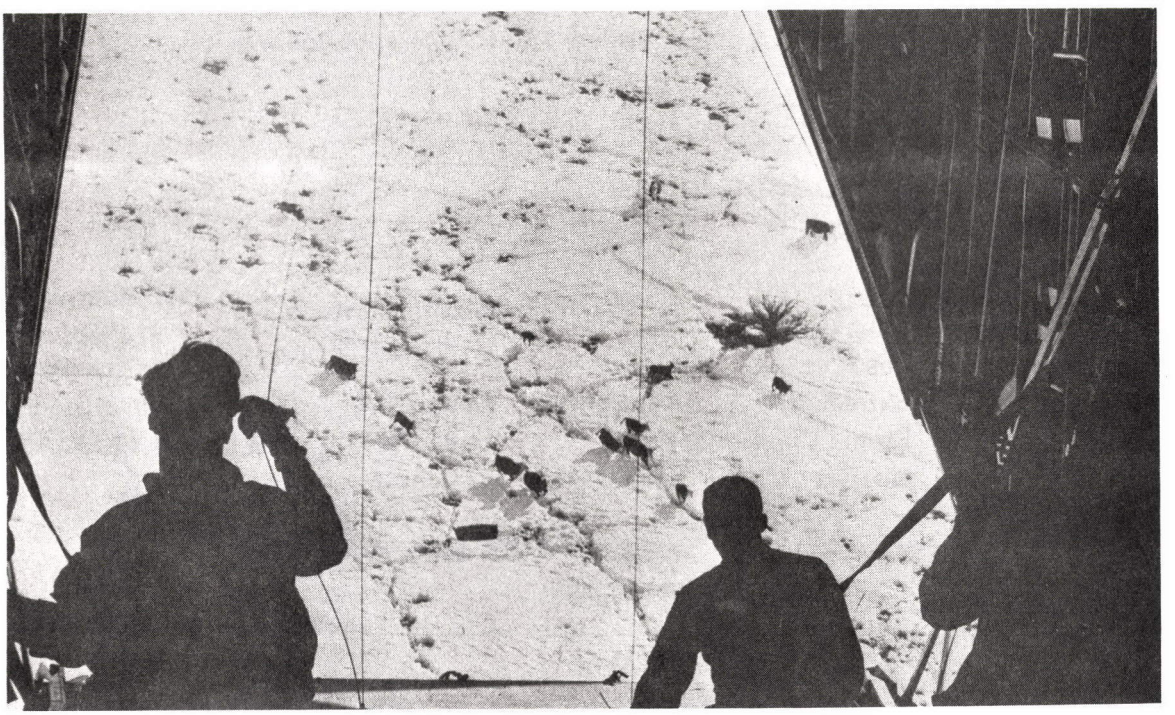
AIRDROP OF PERSONNEL



MARKING ICEBERG FOR TRACKING



DROPPING HAY TO SNOWBOUND CATTLE



Special Airdrop Techniques

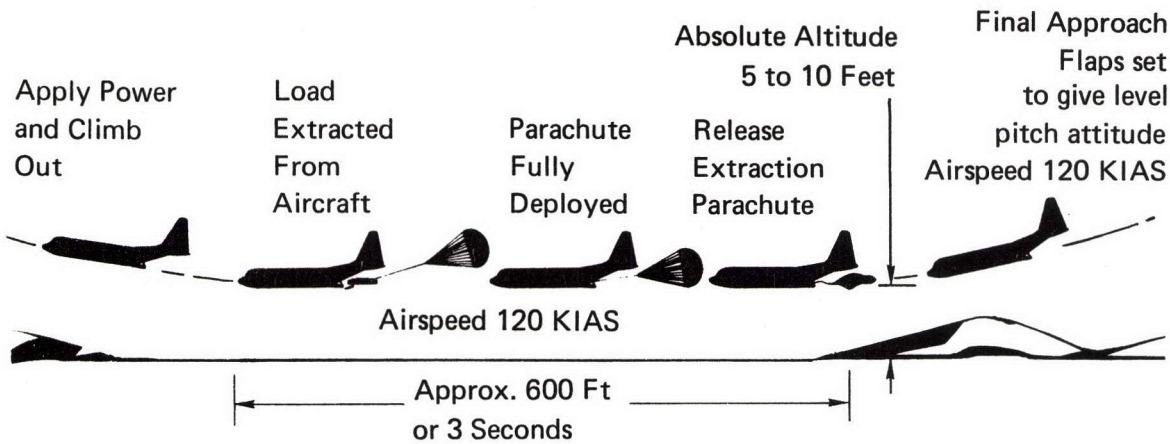
When a very high degree of airdrop accuracy is required, the Hercules operator may wish to consider any of four different techniques which have been developed. Each of these systems requires some special flight crew training to perfect the technique of very low level flight, 12.1 meters to 1.52 meters (400 feet to 5 feet) above the ground, and pinpoint extraction timing.

Low Altitude Parachute Extraction System (LAPES)

The Low Altitude Parachute Extraction System (LAPES) is a method of aerial delivery which utilizes a ring-slot parachute to extract the cargo from the aircraft and decelerate it to a stop. In preparing an airdrop load for LAPES, the cargo is stacked and restrained on a platform (either single or multiple platforms can be used) which is secured in the Hercules by restraint devices on the A/A-32H-4A aerial delivery/cargo handling system.

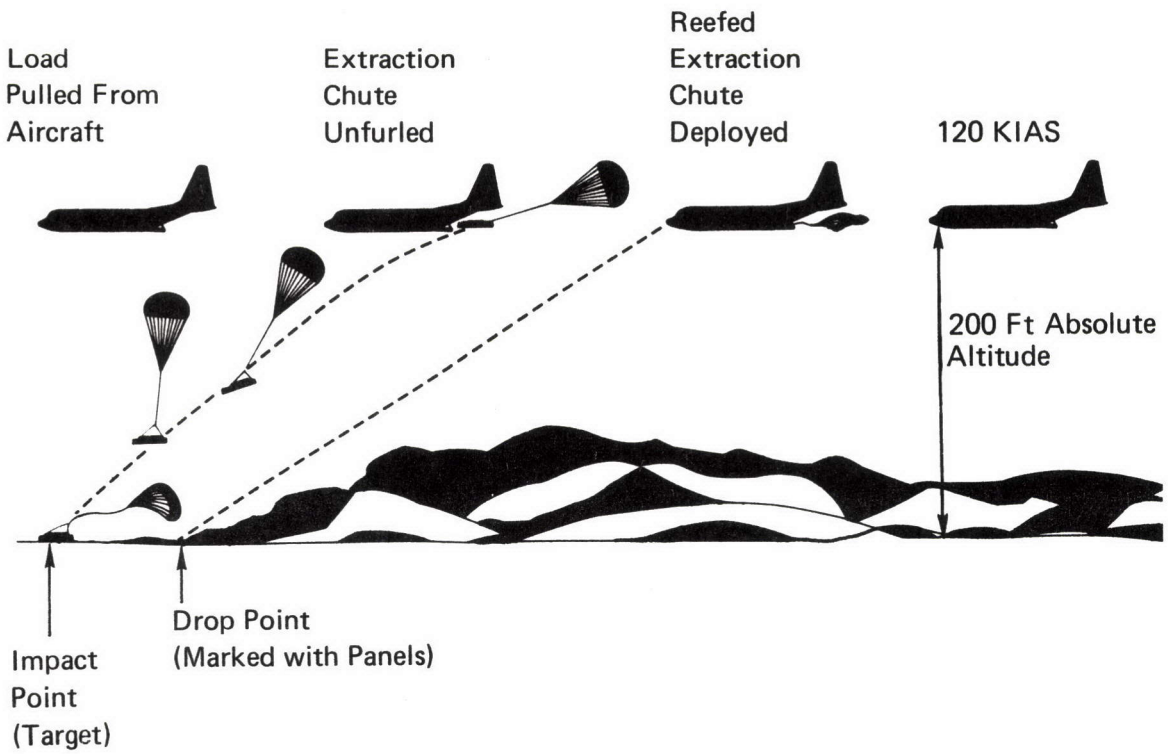
In flight, the Hercules is flown at 120 knots indicated airspeed at less than 3.05 meters (10 feet) above ground. The aerial delivery system (ADS) is activated when over a predesignated point. Activating the ADS releases the extraction parachute into the airstream. Three seconds later, or about 182 meters (600 feet) of ground travel, the cargo leaves the aircraft. Total distance from ADS activation to cargo touchdown is about 213 meters (700 feet). Ground slide distance is on the order of 30.5 – 61 meters (100-200 feet).

One 8.5 meters (28-foot) extraction chute will extract loads up to 5443 kilograms (12,000 pounds). For loads between 5443 and 10,886 kilograms (12,000 and 24,000 pounds), two chutes are used, and so on for heavier loads. Loads up to 22680 kilograms (50,000 pounds) have been delivered by LAPES. A diagram of the LAPES operation follows.

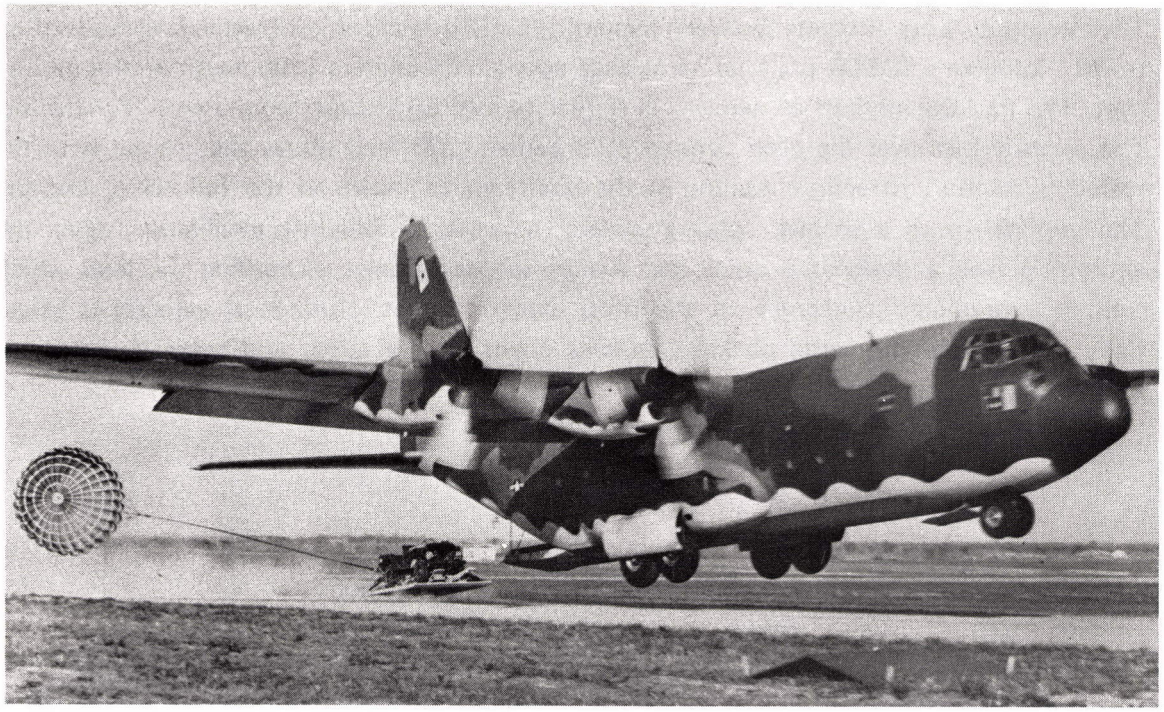

Apply Power and Climb Out
Load Extracted From Aircraft
Parachute Fully Deployed
Absolute Altitude 5 to 10 Feet
Release Extraction Parachute
Final Approach Flaps set to give level pitch attitude Airspeed 120 KIAS
Airspeed 120 KIAS
Approx. 600 Ft or 3 Seconds

Parachute Low Altitude Delivery System (PLADS)

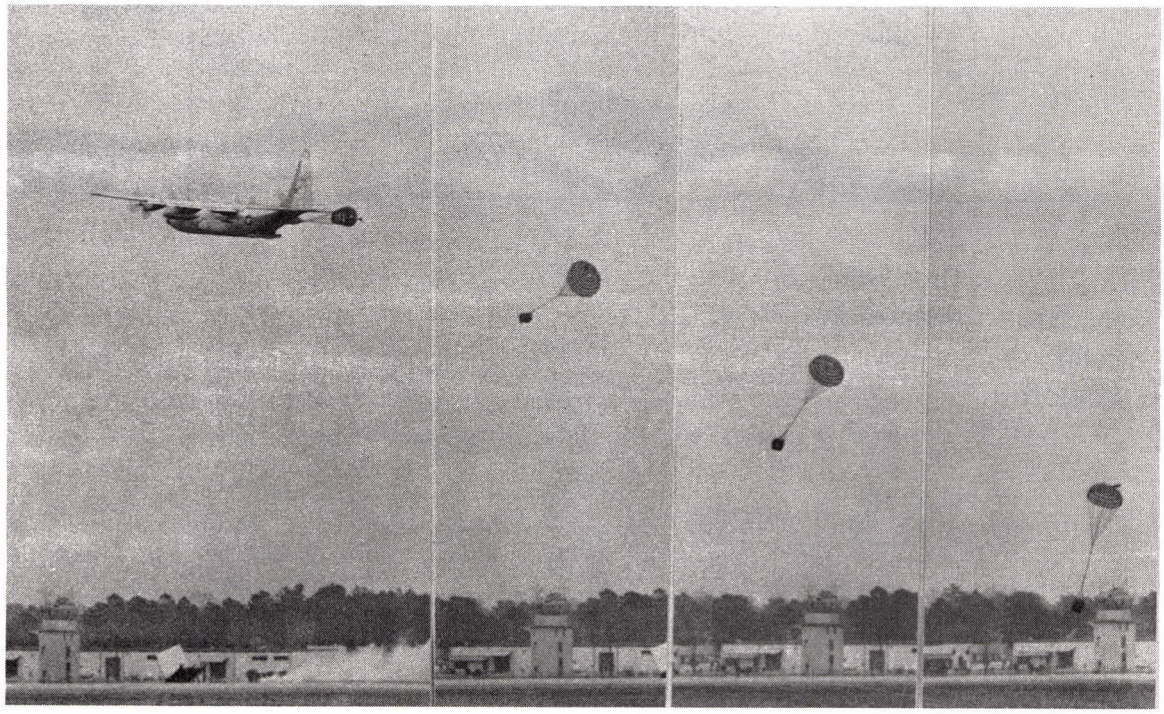
The Parachute Low Altitude Delivery System (PLADS) is capable of delivering loads of up to 907 kilograms (2,000 pounds) to within about 30.4 meters (100 feet) of the desired spot. The PLADS method of delivery is similar to LAPES except for the delivery altitude. The aircraft flies over the drop zone at 60.8 meters (200 feet) above the ground with the reefed extraction parachute trailing in the airstream as shown in the following diagram. The copilot, using a special sighting system, activates a dereefing mechanism when the aircraft is over a designated point and the parachute inflates, extracting the load which follows a predicted trajectory to the drop area or target. Horizontal velocity is essentially zero before the cargo package touches down on the target and there is very little slippage on the ground.



DELIVERY BY LAPES



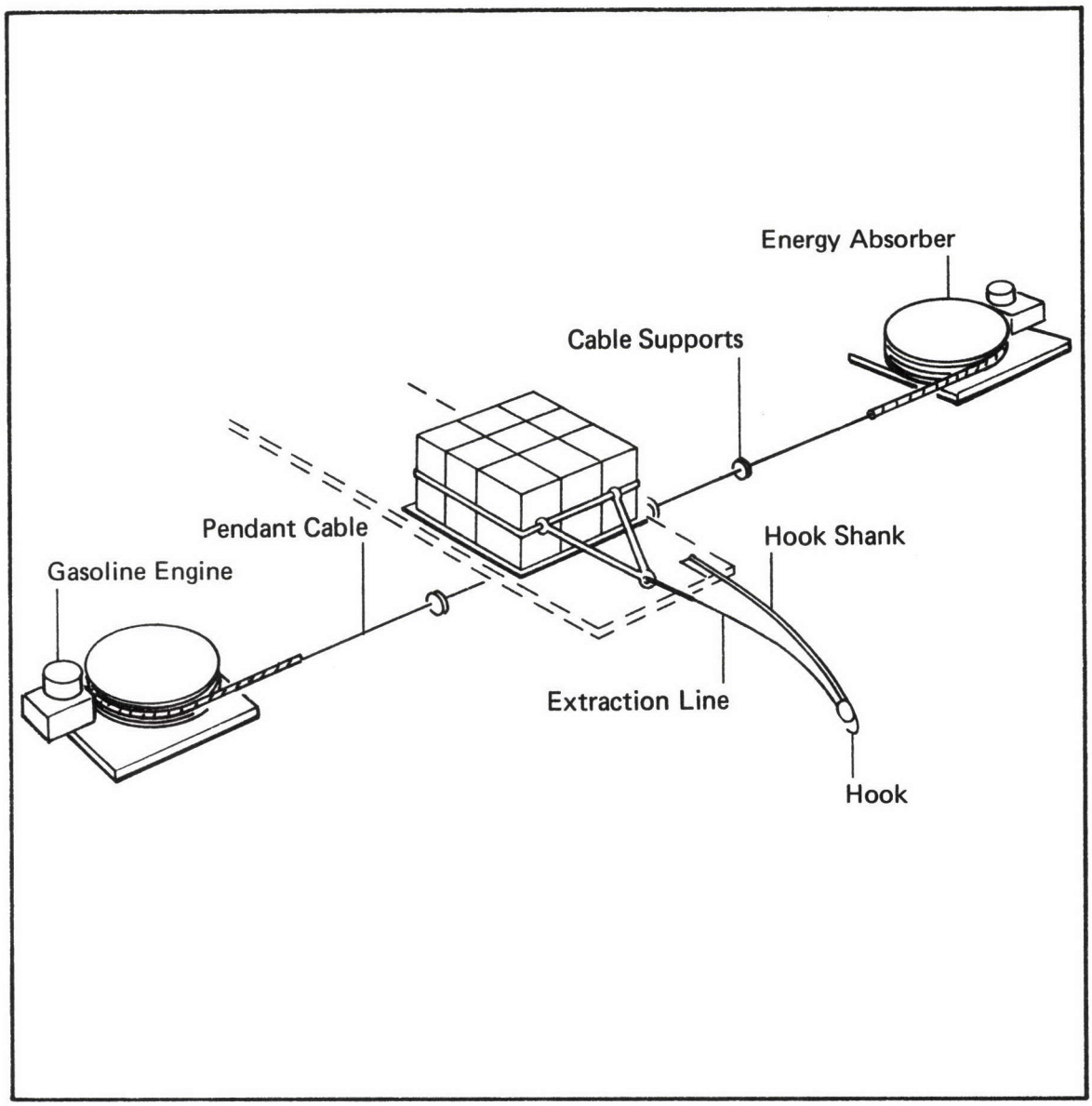
DELIVERY BY PLADS



Ground Proximity Extraction System (GPES)

The Ground Proximity Extraction System (GPES) is also designed to provide highly accurate aerial delivery. The GPES requires ground based cargo arresting equipment as shown in the accompanying diagram.

Using the GPES system the airplane approaches the extraction point at an altitude of about 1.52 meters (5 feet) and an airspeed of about 120 knots, with the ramp open and the extraction hook extended. The hook engages the steel pendant cable, extracting the cargo. The forward momentum of the palletized cargo is diminished by the drag action of the vaned rotors in the "water twister" energy absorbers.



Container Delivery of A-22 Resupply Containers

For the aerial delivery of a large quantity of A-22 resupply containers, USAF has perfected a technique which is more accurate than normal airdrop but not quite as accurate as the LAPES and PLADS system of air drop. These A-22 containers are 132 cm (52 inches) wide, up to 165 cm (65 inches) long, have a fairly rigid plywood bottom and non-rigid canvas sides, and can be loaded with up to a kilogram (2,205 pounds) of cargo. The Hercules can airdrop up to eighteen of the A-22 containers in one load.

For this resupply application of aerial delivery, two rows (sticks) of the A-22 containers are placed on the A/A-32H-4A ADS rail and roller system. With the airplane flying at 61 to 122 meters (200 to 400 feet) altitude and at 120 knots indicated airspeed, the extraction chutes for the most aft containers are released by activation of the ADS system at the desired point. Simultaneously, the airplane is pulled up to a six degree climb angle and the remaining containers exit by force of gravity. This method of aerial delivery has been used for airdrop loads of up to 16,330 kilograms (36,000 pounds) of cargo.

4
Performance

CHART/GRAPH CRITERIA

The purpose of the performance charts herein is for planning complete missions from takeoff to landing in normal operating conditions. The data in the charts are representative of operating procedures which are consistent with those in the airplane flight manual. The data are based on performance capabilities obtained from USAF/Lockheed flight tests of the airplane configuration which includes external fuel tanks. The data for the charts were calculated for international standard atmosphere (ICAO) conditions except where noted otherwise.

Takeoff ground run distances on page 43 were computed for normal military operational techniques which include pressurization bleed on, wing flaps 50 percent deflected, all four engines operating at takeoff power, and lift off at the greater of either 110 percent of power-off stall speed or minimum control speed. The distances for normal takeoff to clear a 15.2 meter (50 foot) height on page 42 are the sums of ground run distances plus the air distances to climb from liftoff to a 15.2 meter (50 foot) height. These takeoff data are those for a smooth, hard surface runway with zero slope, zero wind, and no assisted takeoff (ATO) power.

The climb and speed/altitude charts on pages 45 and 46 were computed using normal rated engine thrust (NRT) with gear and flaps retracted.

A range integration chart is shown on page 47 for long range cruise flight at constant altitudes and flight at cruise ceiling using 609 meters (2,000 feet) step-climb procedure. This step-climb procedure is a practical technique for approximating the ideal technique of cruising at cruise ceiling.

Optimum endurance cruise with four engines operating is depicted on page 48 showing the altitudes, airspeeds, and fuel flows for varying gross weights.

Search endurance for low level (sea level altitude) surveillance is shown on page 49. For this operation, best endurance is obtained by using only the two inboard engines with the two outboard engines/propellers feathered. The data were computed for flight at 145 knots indicated airspeed using 35 percent wing flaps.

Time, distance, and fuel to descend were computed for normal descent procedures, using the speed schedule shown. These data are presented on page 50.

The chart on page 51 shows the amount of reserve or holding fuels used for three different conditions.

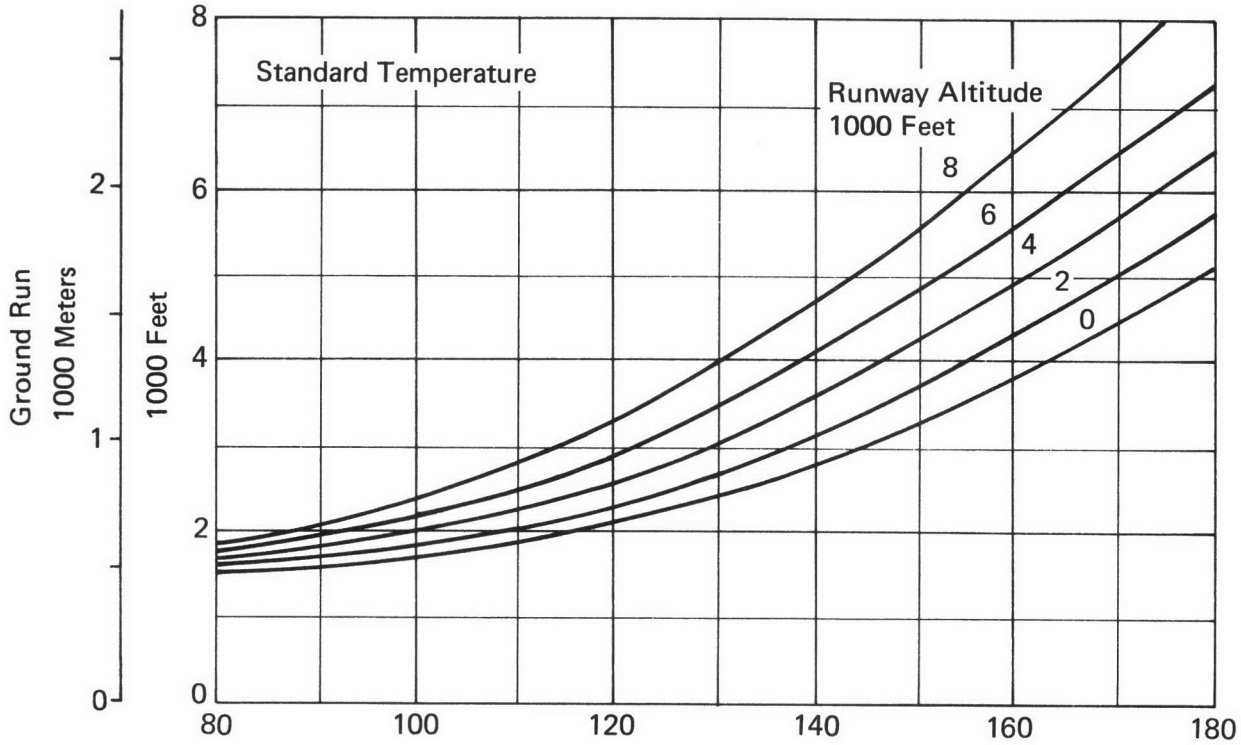
Landing distances were calculated for normal operations which are with full flaps, maximum reverse thrust on four engines, maximum braking on a hard surface, smooth runway, touchdown at 120 percent of power-off stall speed, and a threshold speed 135 percent of power-off stall speed. These landing distances are shown on page 52.

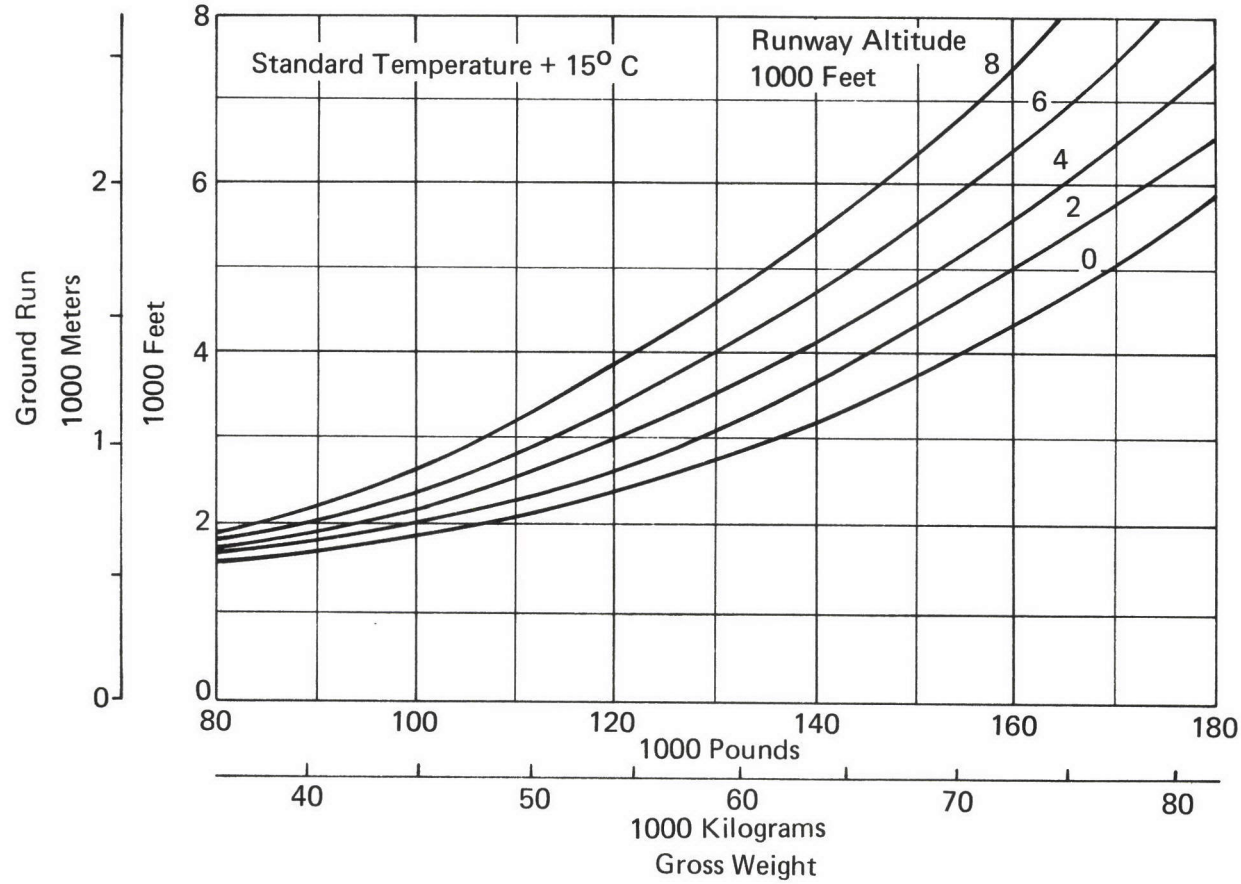
CHART/GRAPH CRITERIA (Continued)

The payload-range computations for the graph on page 53 were made for normal operating conditions of 2.5g maximum payload of 29,574 kilograms (43,160 pounds) and 70,295 kilograms (155,000 pounds) takeoff weight and for contingency conditions of 2.25g payload and 79,365 kilograms (175,000 pounds). Ranges are shown for the standard fuel capacity of 26,344 liters (6,960 gallons) and for the capacity of 36,639 liters (9,680 gallons), including two external fuel tanks. Ranges were computed using normal rated thrust (NRT) climb to cruise ceiling, long-range cruise flight and a reserve fuel allowance of one hour at cruise altitude. Cruise fuel flows and airspeeds were computed for long range cruise flight at optimum altitude – fuel flows and speeds for 99% maximum range at ceilings for 300 fpm rate of climb, using maximum continuous engine thrust. For these conditions, average fuel flow is 4100 pounds per hour, average cruise speed is 305 knots true airspeed and average cruise ceiling is 9754 meters (32,000 feet).

The block speed and block fuel graphs on page 54 are consistent with the payload-range chart. Block speeds were computed from the times and distances to climb and cruise plus a 15 minute allowance for engine start, taxi, takeoff, and maneuver. Block fuel is the sum of the fuels for start, taxi, take-off, climb and cruise.

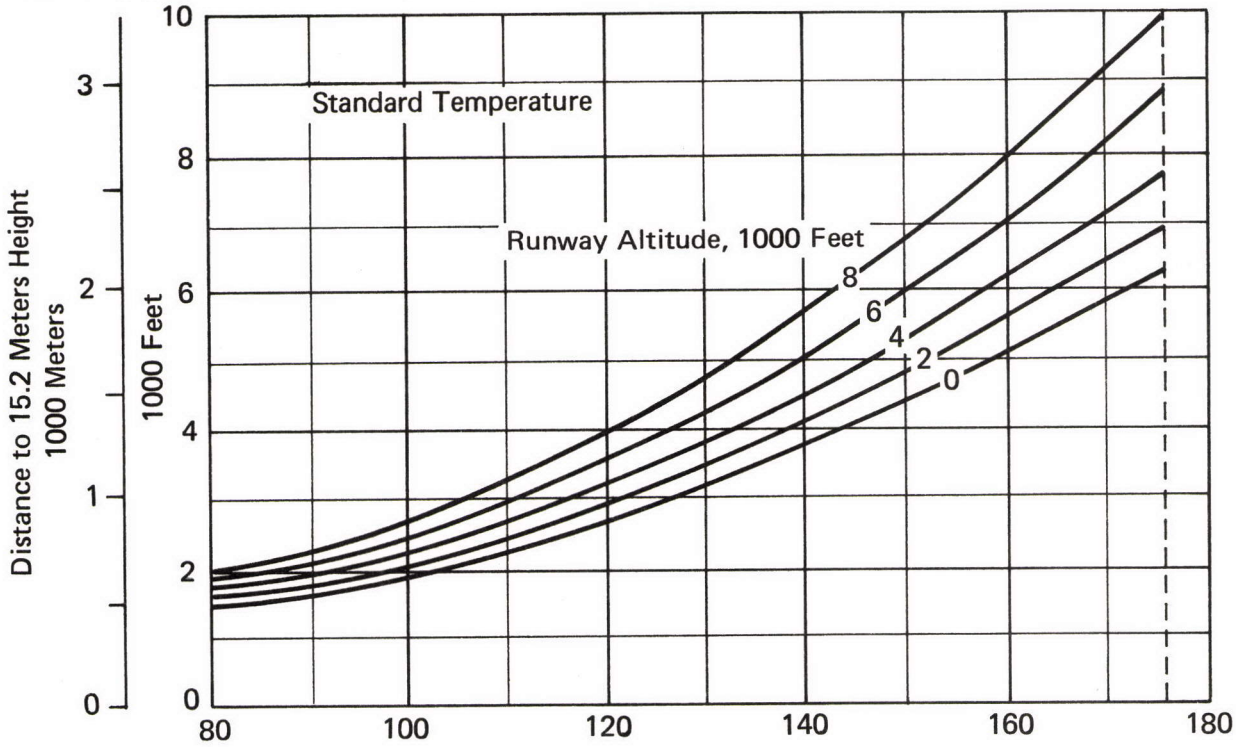
NORMAL TAKEOFF DISTANCES – GROUND RUN | Half Flaps, No Wind or Runway Slope

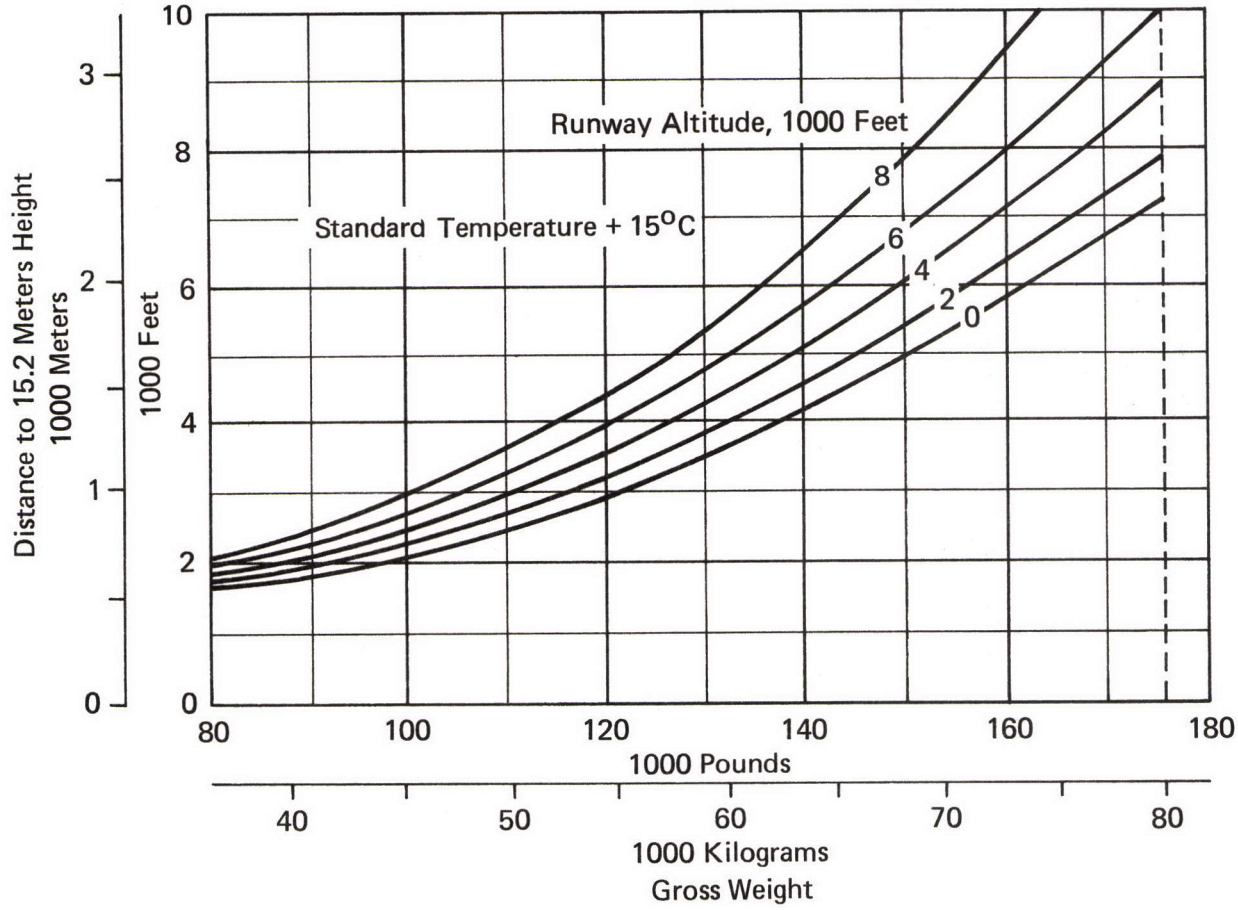




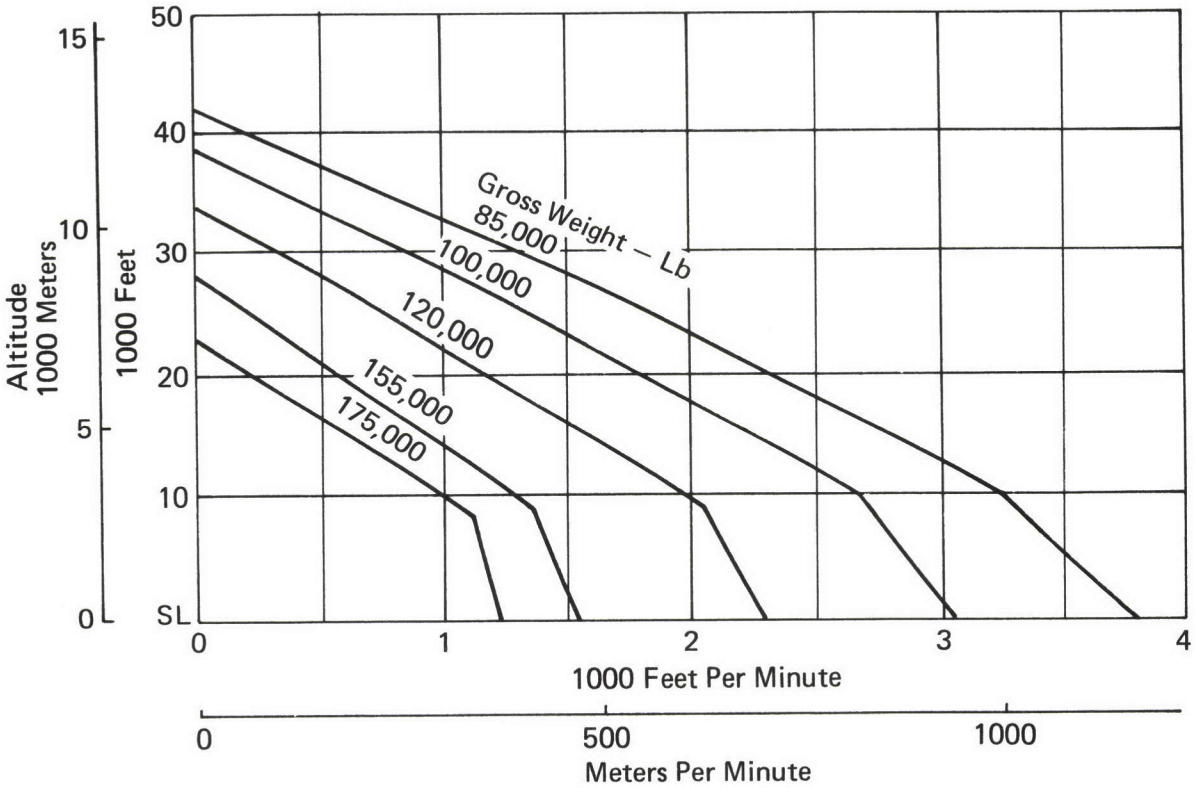
NORMAL TAKEOFF DISTANCES – To a 15.2 Meter (50 Foot) Height

Half Flaps, No Wind or Runway Slope

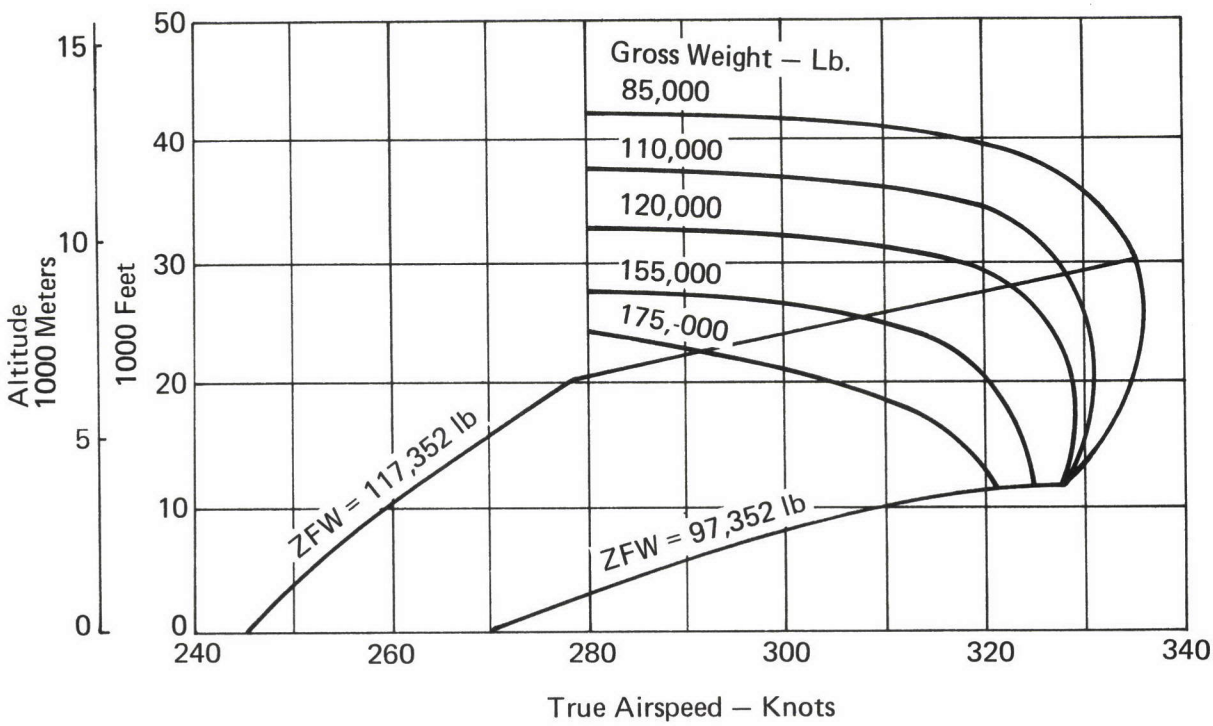




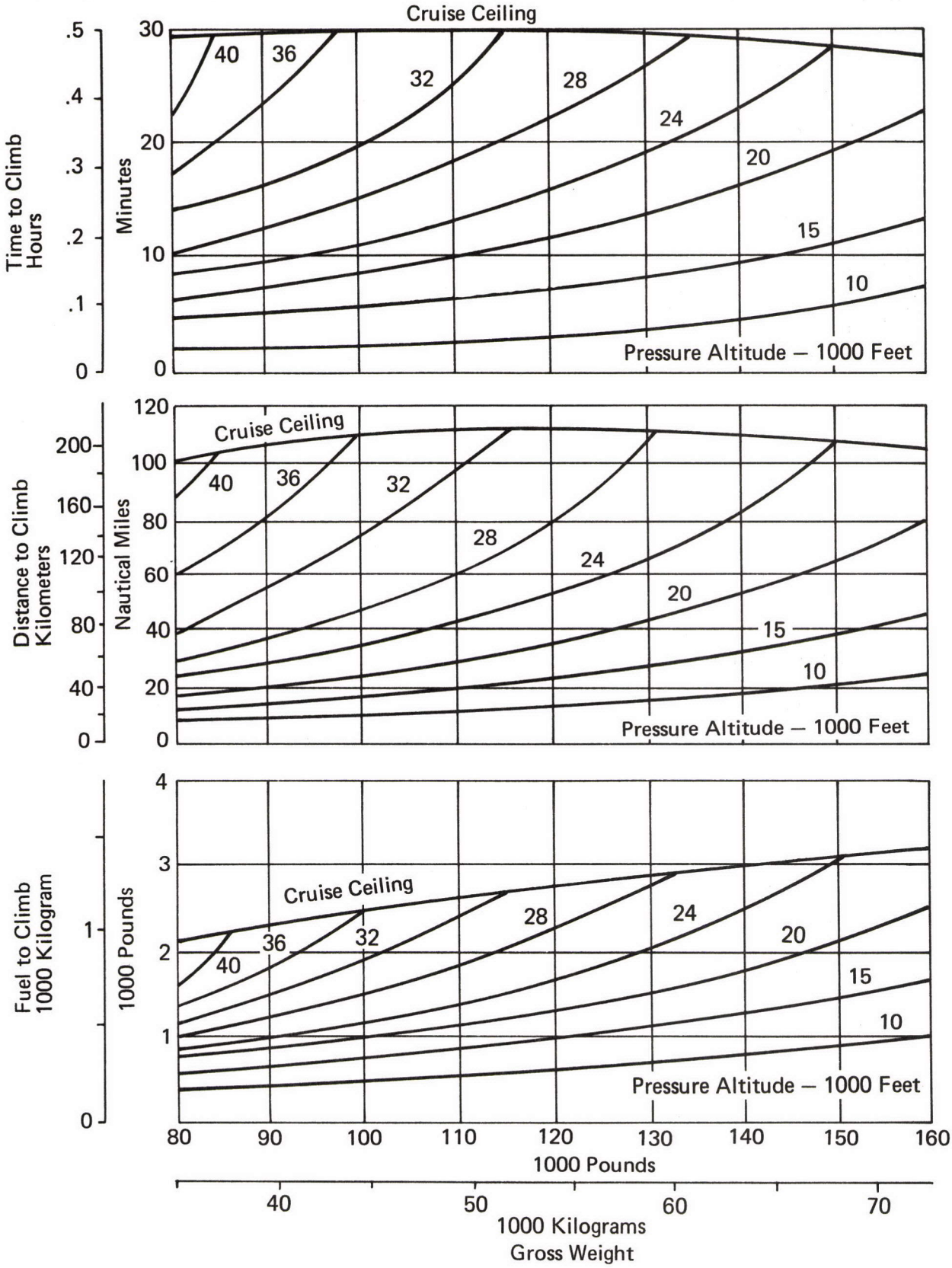
RATE OF CLIMB | Normal Rated Thrust



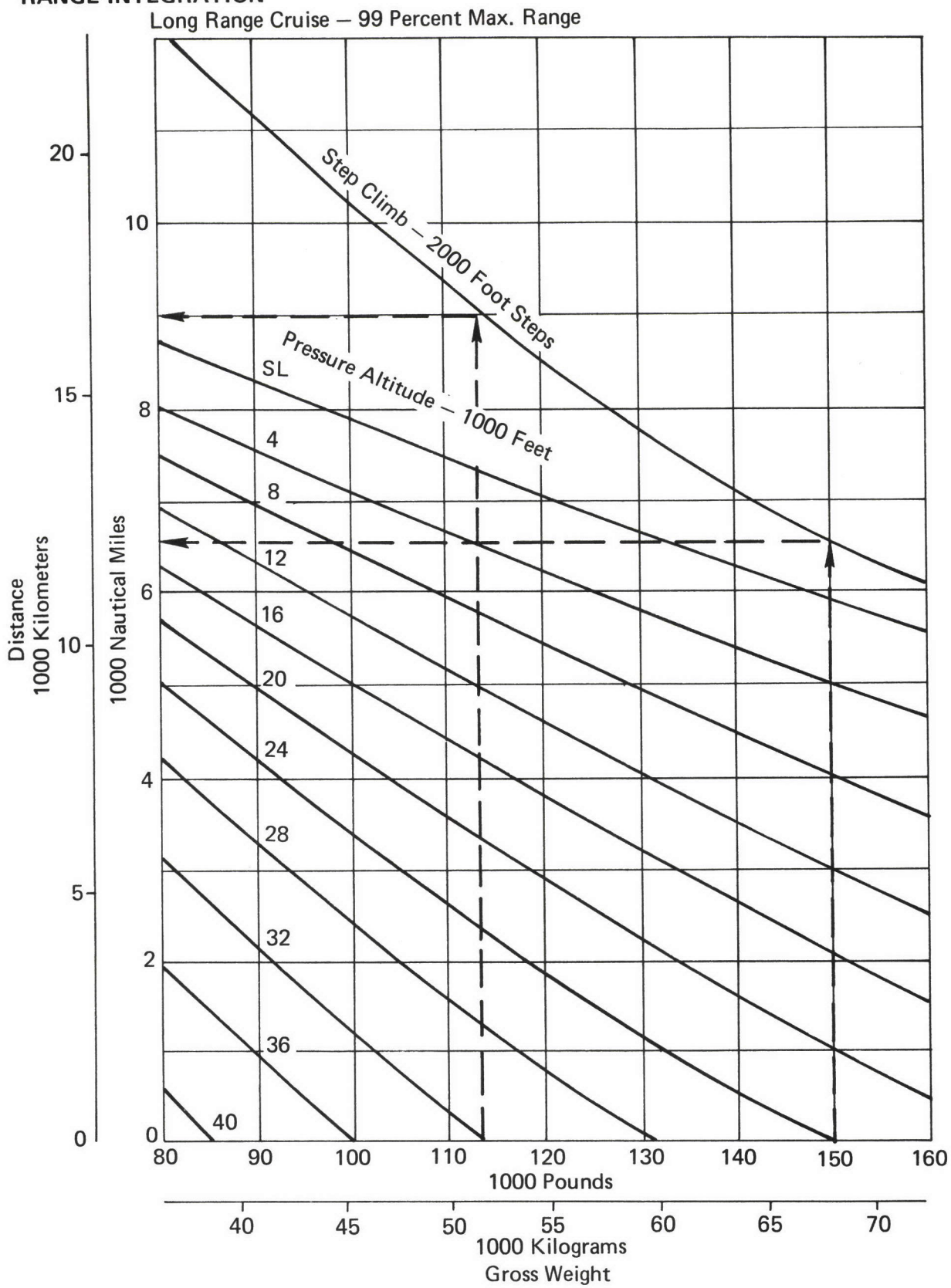
SPEED/ALTITUDE SUMMARY | Normal Rated Thrust



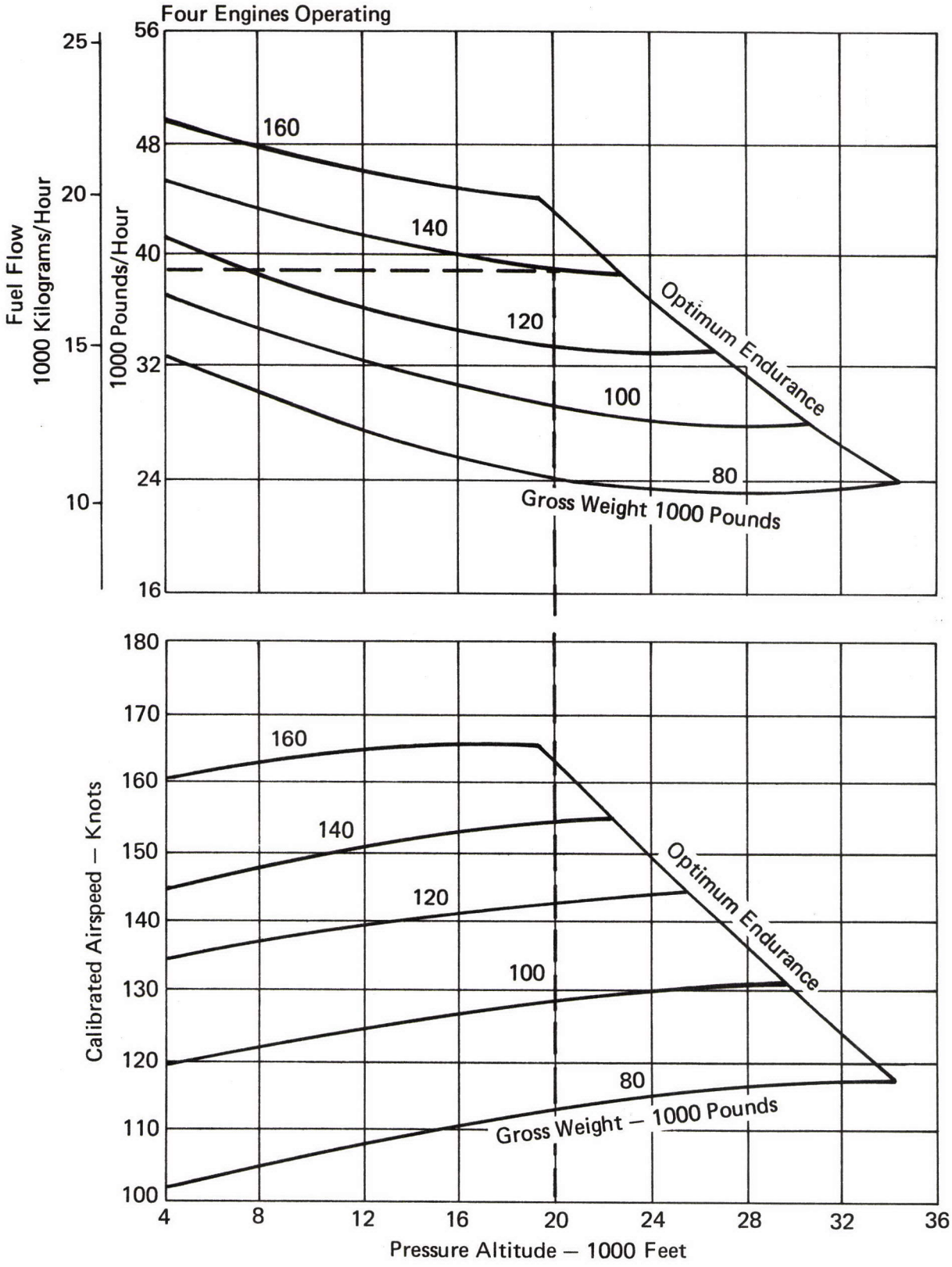
TIME, DISTANCE, AND FUEL TO CLIMB



RANGE INTEGRATION

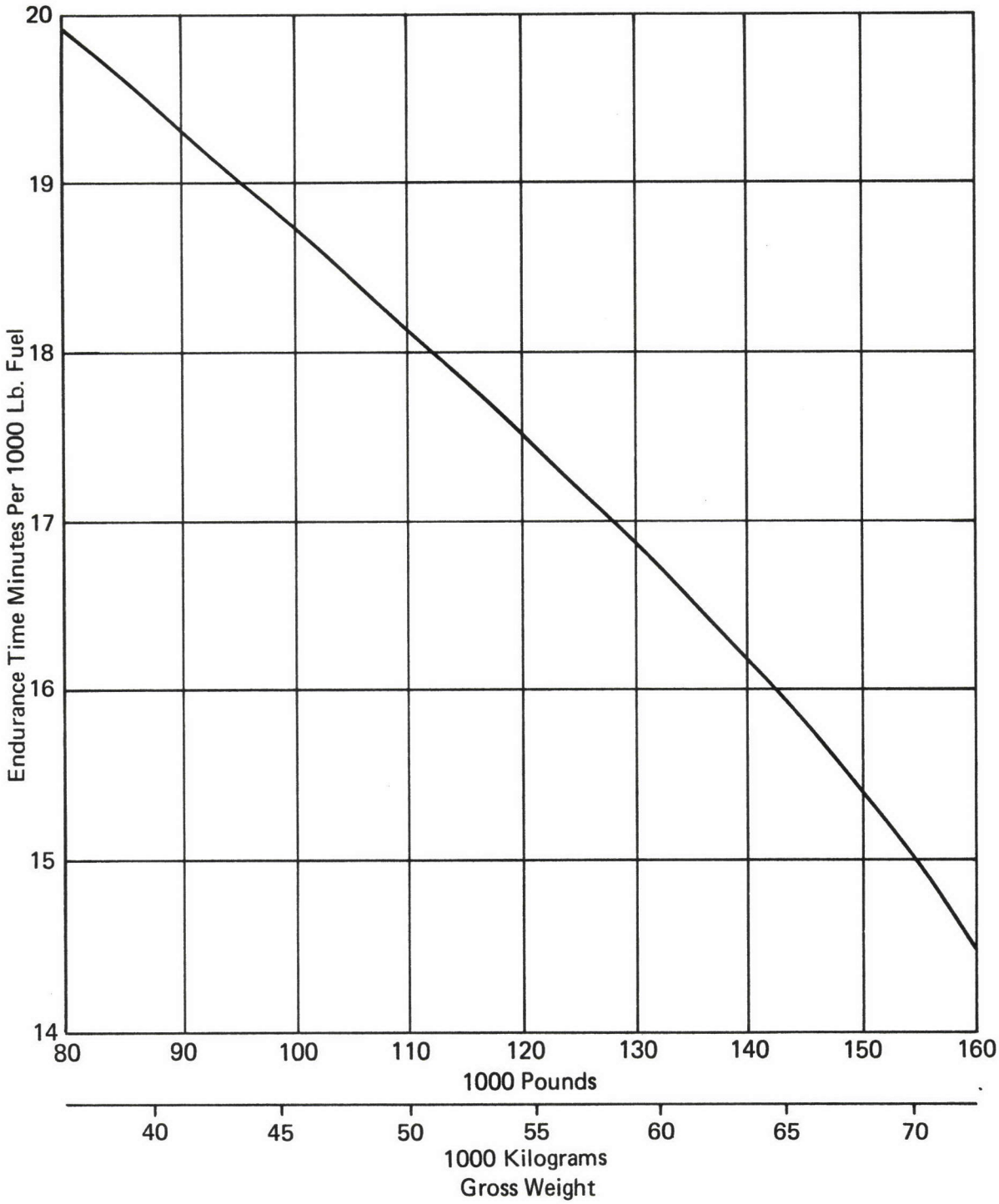


OPTIMUM ENDURANCE CRUISE



SEARCH/SURVEILLANCE CRUISE

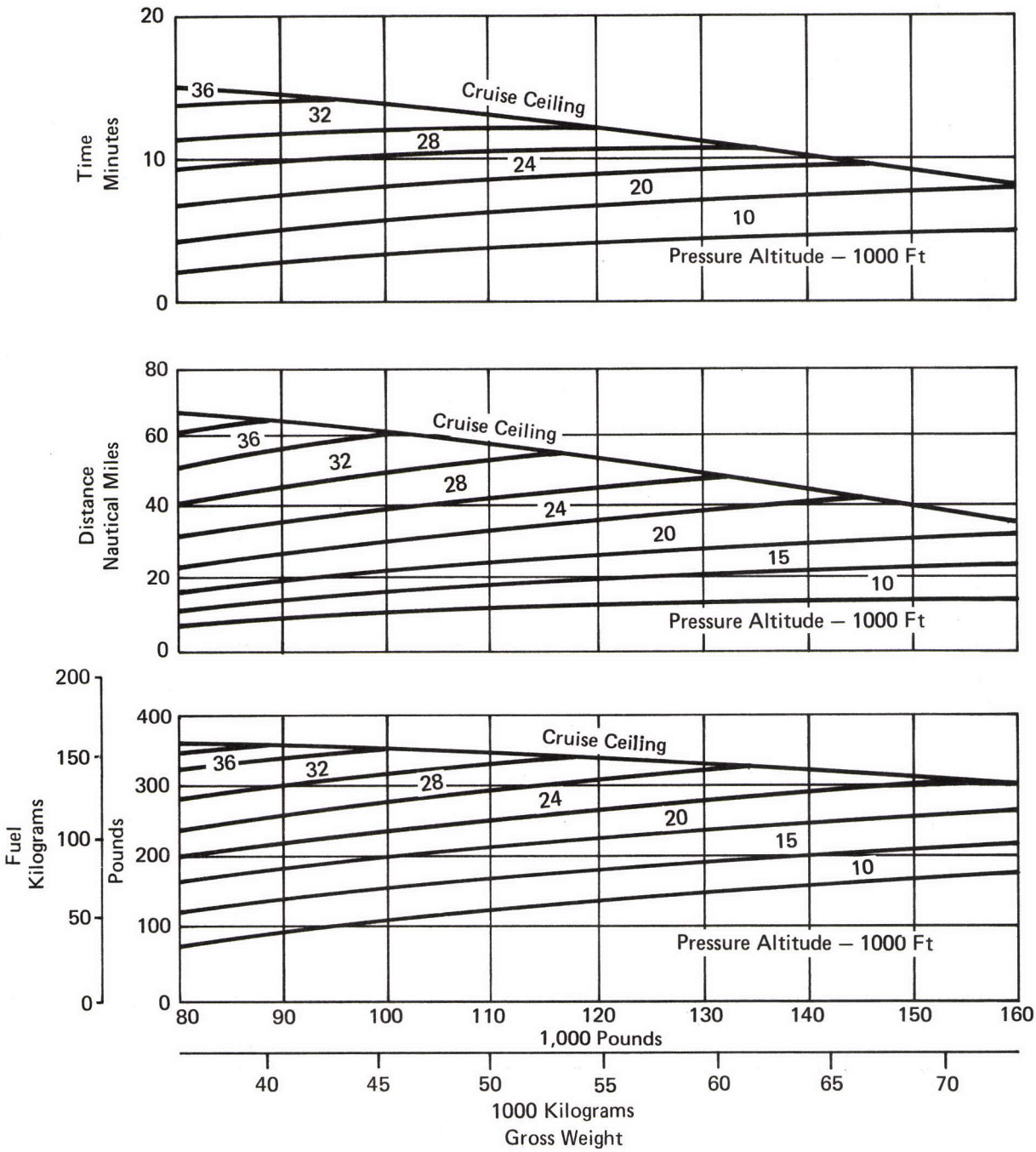
Sea Level Altitude
Two Engines Operating, Two Feathered
Flaps 35 Percent
145 Knots Indicated Airspeed



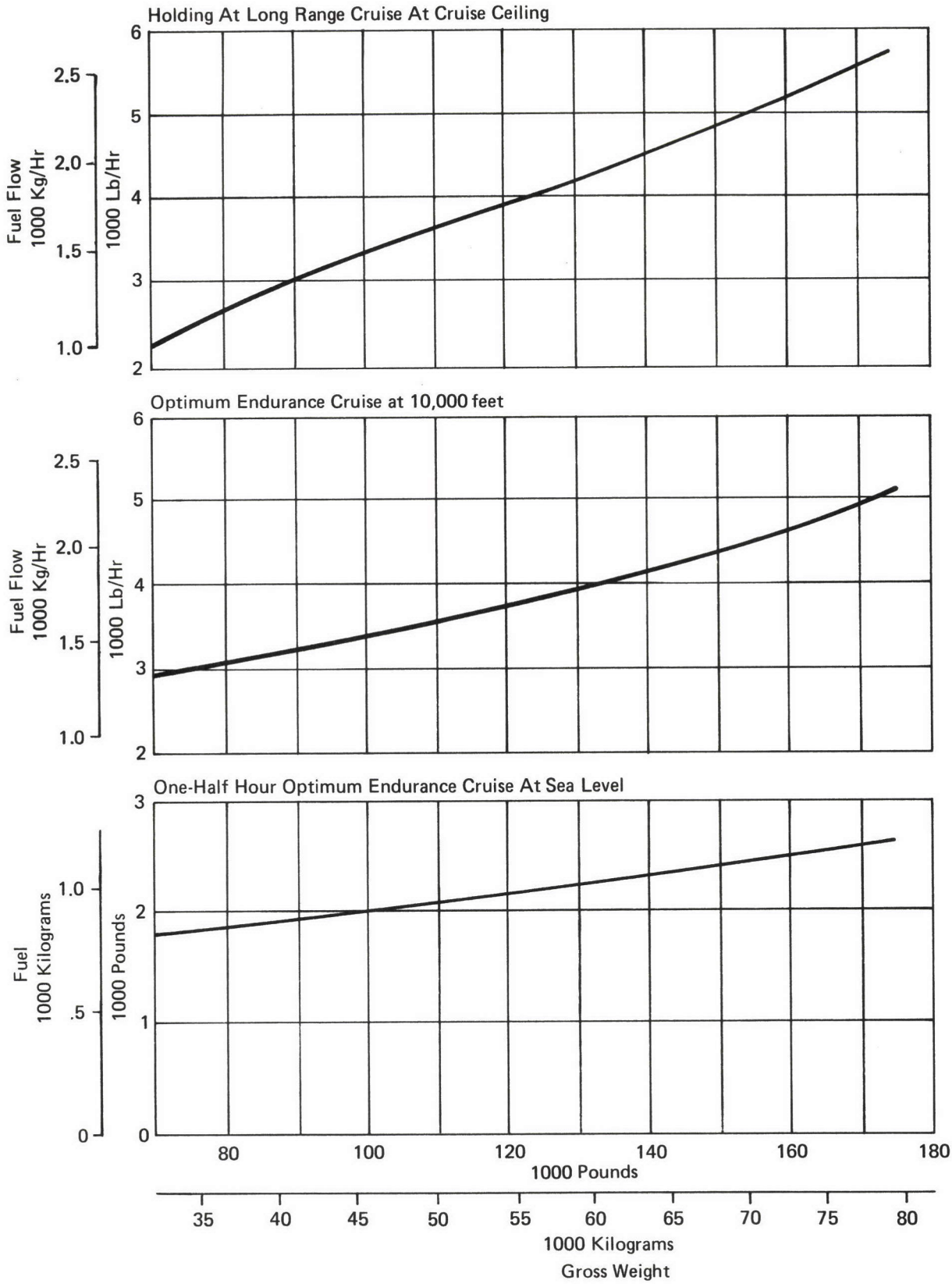
TIME, DISTANCE, AND FUEL TO DESCEND

Speed Schedule – KIAS

Weight		Cr. Ceiling to 20,000 Ft	20,000 Ft to SL
36,388 kg	80,000 lb	132	250
45,360 kg	100,000 lb	148	250
54,432 kg	120,000 lb	163	250
63,504 kg	140,000 lb	176	250
72,576 kg	160,000 lb	189	250

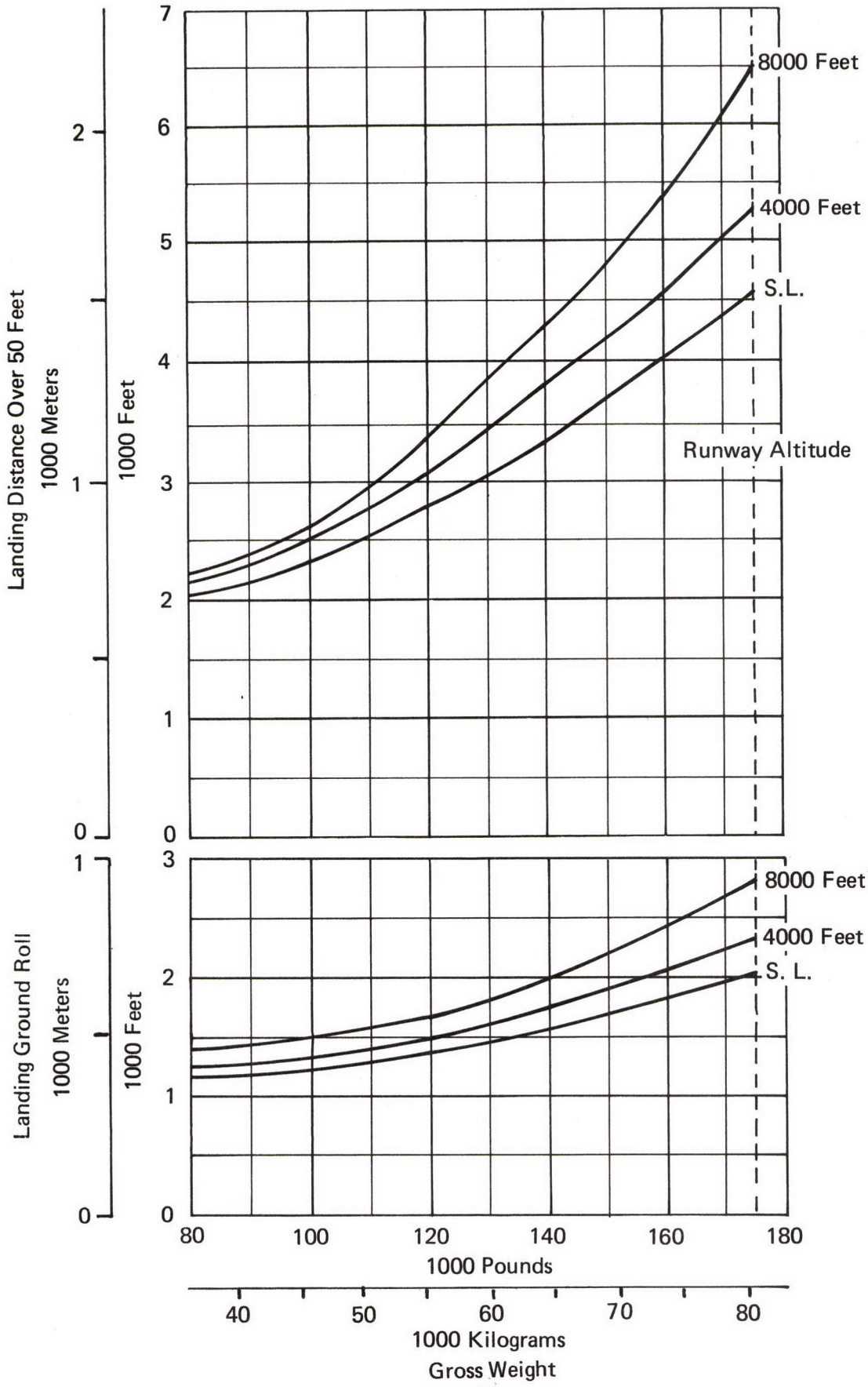


RESERVE AND HOLDING FUEL



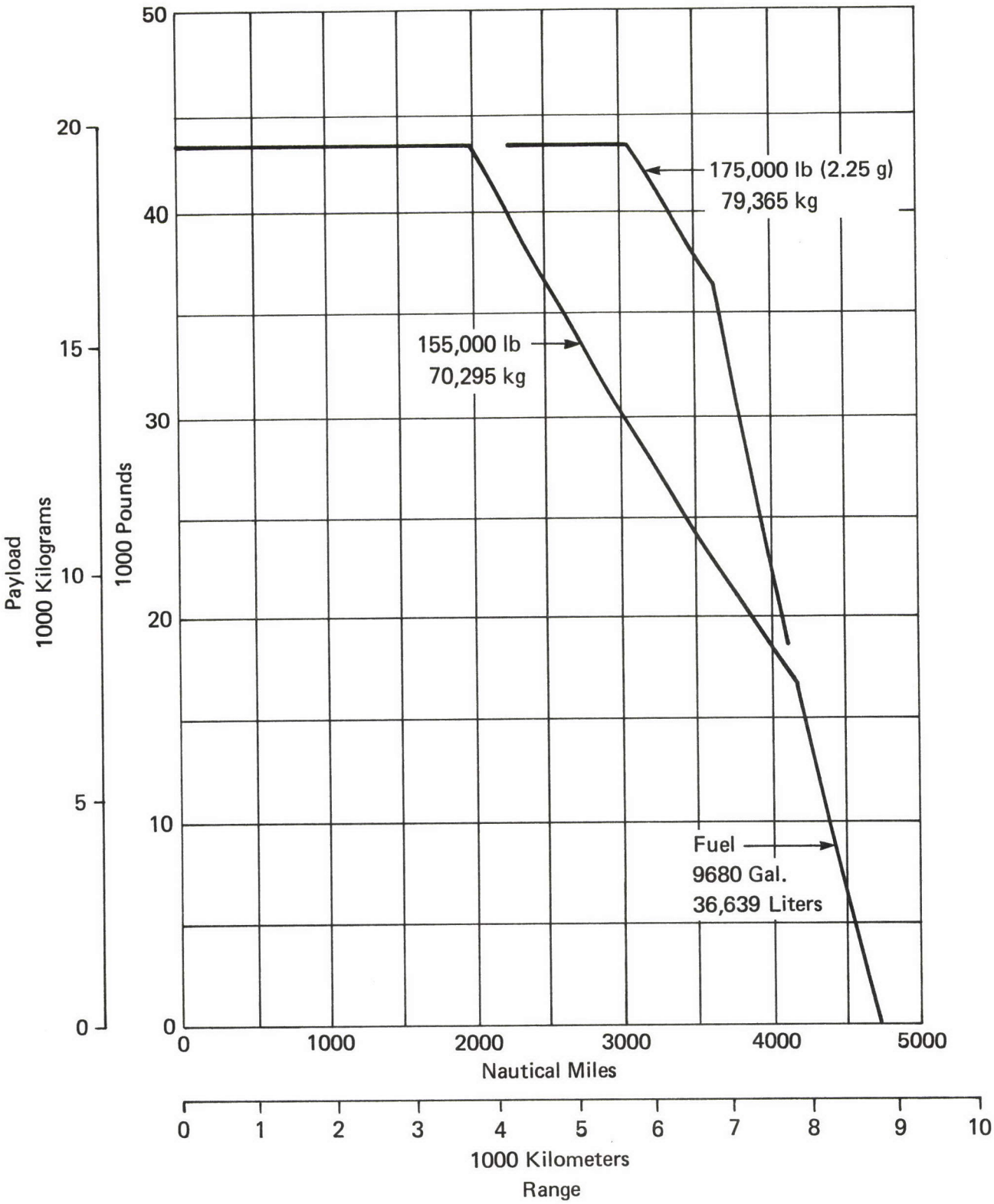
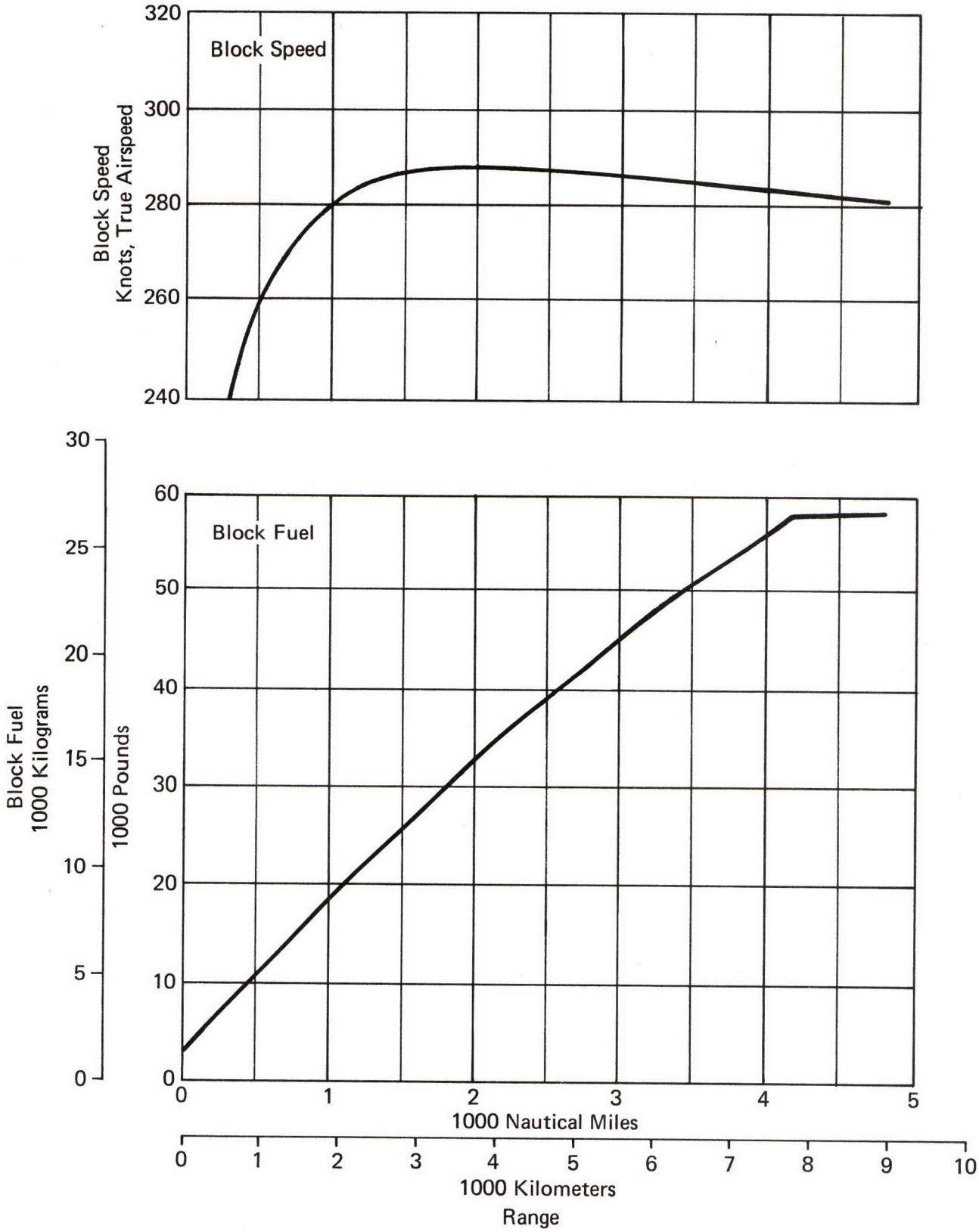
NORMAL LANDING DISTANCES

Full Flaps • Full Brakes • Four Engines Reverse Thrust
Smooth Paved Surface • Zero Wind • No Runway Slope



PAYLOAD-RANGE

Long Range Cruise At Cruise Ceiling
One Hour Reserve Fuel



BLOCK SPEED, BLOCK FUEL | Long Range Cruise At Cruise Ceiling